PESTICIDES ABSTRACTS

December 1976 - Vol. 9, No. 12
Abstracts 76-2876-3120
PSTAB 09(12) 819-874 (1976)

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

CONTENTS

Volume 9 **December 1976** **No. 12**

Page

General 819
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 821
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 835
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 842
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 868
(Preparation of samples; analytical methods; instrumentation)

76-2876. Barbera-G., C. (Schering Agro S.A., Barcelona-8, Spain). **Desarrollo de nuevos pesticides. [Development of new pesticides.]** *Afinidad* 33(333): 21-30; 1976. (16 references) (Spanish)

The four stages in the development of a new pesticides are traced: synthesis and primary screening; advanced screening (toxicology) and start of production; worldwide testing and supplementary studies including legal and economic aspects; and eventual commercialization. It is repeatedly pointed out that, at any stage of the way, these projects may be abandoned or shelved. Two factors receive special emphasis. There is an increasing length of time between the initial testing of a compound and its introduction onto the market. For technical and economic reasons, there is also a decreasing probability that a compound will successfully undergo the various phases of development. Several tables illustrate the increase between 1950 and 1975, in the amount of data required before official approval of a pesticide. Also considered are the spiraling expenses involved in the launching of a pesticide, individual costs for each product, and evulation costs for all successful and discarded products. Continuing expansion in the field of pesticides is predicted, largely because of the benefits derived from their use.

76-2877. Sales Barquets, R. (Author address not given). **Sintesis de principios activos para la industria fitosanitaria. [Synthesis of active principles for the phytosanitary industry.]** *Afinidad* 33(333): 31-35; 1976. (Spanish)

Active principles, i.e., products with various types of biological activity, play an essential role in the phytosanitary industry, either by themselves or as ingredients for syntheis. Some misgivings existing about this sector of chemistry the general problem is explained. In parallel with the drug industry, a need is seen for a "phytopharmacopoeia". Teamwork plays a great role in the elaboration of synthetized products. The importance and advantages of laboratory research prior to industrial application should not be underestimated, as illustrated by the chlorosulfonation of a benzene derivative. The value of pilot projects is also considered. Finally, there is a discussion of the problems of environmental pollution due to phytosanitary products. The example of a hypothetical factory responsible for multiple sources of extreme contamination serves to demonstrate the far-reaching consequences of industrial synthesis on the surrounding atmosphere, waters, flora, and fauna.

76-2878. Azzaria, L. M.; Habashi, F. (Dep. Geol. Mineral., Univ. Laval, Quebec, Canada). **Mercury pollution—examination of some basic issues.** *CIM Bull.* 69(772): 101-107; 1976. (47 references)

Although both manmade and natural sources release mercury into the environment, there is a lack of agreement on the relative importance of each. However, it is obvious that mercury released by natural processes, whether soil degassing, weathering, or volcanic activity, is much more widespread over the earth's surface, whereas man's release is more highly concentrated in specific areas. Nature's contribution to mercury pollution is relatively constant, whereas man's appears to be constantly increasing. A variety of forms of mercury are found in nature and there is no evidence to support the theory that all mercury will be transformed into mercury sulfide and therefore become harmless. There is as yet no data concerning the effects of long term subacute exposure to mercury. Such studies are recommended by public health officials. Curtailment of mercury discharge is urged.

76-2879. Belonozhko, G. A.; Vrochinskiy, K. K. (Author address not given). **Voprosy gigieny truda na 5-y Vsesoyuznoy Nauchnoy Konferentsii "Noveyshie Voprosy Gigieny Primeneniya Pestitsidov" (Kiev, Iyun' 1975 g.). [Health questions discussed at the Fifth All-Union Scientific Conference on "New Problems Pesticides Use" (Kiev, June 1975).]** *Gig. Tr. Prof. Zabol.* 3: 56-57; 1976. (Russian)

Highlights of the 1975 All-Union Scientific Conference on New Problems of Pesticides Use are presented. Ecological, hygienic, and toxicologic studies of pesticides should deal with not only the intact pesticides and their metabolites, but also compounds which they may form with other substances in plants, soil, and water. Polychloropinene was found to form cyanides with nitrogen fertilizers in the soil. Air pollution due to the emission of pesticides from spray solutions can be substantially reduced by the addition of alcohol type evaporation retarding additives. The hygienic standardization of pesticides in the environment in general and in the workplace air in particular requires continued efforts.

76-2880. Walsh, J. (Author address not given). **Cosmetic standards: are pesticides overused for appearances sake?** *Science* 193(4255): 744-747; 1976.

A Berkeley study group report for the EPA criticized the existing food quality standards and the quality standards imposed by growers' cooperatives, which achieve high cosmetic appearance of produce at the cost of unnecessarily heavy use of insecticides. These standards restrict the volume of produce reaching the market, thus raising prices and benefiting growers more than consumers. One study suggests that the use of pesticides could be cut by more than 50% on tomatoes grown for canning. Some critics of the report state that the cosmetic standards are justified in that they prevent the marketing of produce with blemishes associated with pathogens or toxins dangerous to health, but which consumers could not recognize. When pesticides are used for cosmetic purposes, they are often applied shortly before harvesting to prevent the presence of insect debris in the produce. Often the harvesters enter the field too soon after application of the chemicals. in the case of processed foods it is contended that no hazards to health would arise if the levels of insect debris permitted to remain in processed food were raised somewhat. It is re-

commended that pest control advisers not be allowed to be directly or indirectly employed by agricultural chemical companies, and that these advisors not profit personally from the application of any pest control method.

76-2881. Fujiya, M. (Freshwater Reg. Fish. Res. Lab., Fishery Agency, Min. Agric. For., Japan). [**Dynamic status of pesticides in aquatic environment; absorption of pesticides by fish and the fate of pesticides in fish.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 325-328; 1976. (1 reference) (Japanese)

A study revealed that the appearance of malformation artificially hatched salmon fry was due to DDT accumulated by the parents body and transferred to the eggs. It is apparent that a cleaner aquatic environment is necessary for hatching and breeding fish in "production fishery" than in "natural production fishery". The fact that fish lose their response to sound after 3 years of maintenance in water containing only 5 ppb of dieldrin was explained electrophysiologically and was interpreted as the cause of their disappearance in nature. A large portion of applied pesticide may eventually enter the aquatic environment. The effects of pesticides in the environment on aquatic organisms, including accumulation of pesticide residues in fish via the food chain and the respiratory route are described. The fact that fishermen are not informed of the kind and amount of pesticides applied around the areas in which they catch or breed fish, while farmers are not informed of the fishery action carried out in the area beyond the fields to which they apply pesticides is undesirable and should be improved by administrative guidance.

76-2882. Asakawa, M. (Nat. Inst. Agric. Sci., Min. Agric. and Forestry., Tokyo, Japan). [**Importance of and problems in elucidating the dynamic status of pesticides in the environment.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 295-296; 1976. (Japanese)

The importance and problems of elucidating the environmental dynamic status of pesticides applied for crop protection were described. The case of DDT and BHC, which have been banned for years but are still detected in minute amounts in mothers' milk and agricultural products, illustrates the close relationship between the fate of applied pesticides and their residual toxicity and environmental pollution. In studies on the environmental dynamics of pesticides the importance of elucidating the pattern of each pesticide under various environmental conditions was pointed out. In particular, those which result in more potent biologically active metabolites should not be neglected. In addition, the necessity of elucidating the combined physiologic effects and dynamics of more than one pesticide was emphasized, as well as the monitoring of pesticide residues from the viewpoint of the method and the system.

76-2883. Kruglov, Yu. V.; Maslennikova, V. G. (All-Union Sci. Res. Inst. Agric. Microbiol., Leningrad, USSR). **Razlozhenie i raspredelenie ^{14}C simazina v pochve. [Decomposition and distribution of simazine—^{14}C in soil.]** *Agrokhimiya* 6: 112-115; 1975. (11 references) (Russian)

The decomposition and distribution of ^{14}C-simazine was studied in sterile and non-sterile acid podzol; after 4.5 months of incubation at 26°C, 6-11% free simazine was extracted from non-sterile soil. The aqueous extract contained 6-7% of the radioactivity, apparently in the form of hydroxysimazine. Carbon dioxide released accounted for 0.42-0.9% of the radioactivity, while 55.5-91.7% were found in the alkaline extract of humic acids and at least half of this substance precipitated with humic acid. Up to 27.1% were firmly bound to the mineral components of the soil. Similar relationships were found in sterile soil. The formation of a firm bond between simazine and humic acid was confirmed in model experiments using humic acid. The findings indicate the high stability of the triazine ring, and the negligible participation of soil microorganisms in the decomposition of simazine in the soil during the first 4 months.

76-2884. Lunde, G.; Gether, J.; Steinnes, E. (Central Inst. Ind. Res., PB 350, Blindern, Oslo 3, Norway). **Determination of volatility and chemical persistence of lipid-soluble halogenated organic substances in marine organisms.** *Ambio* 5(4): 180-182; 1976. (15 references)

The application of a new method for determining total levels of organic-bound halogens in biological material is described. In marine organism samples the degree of volatility and chemical persistence was determined by steam codistillation with cyclohexane for halogen-containing non-polar (lipid-soluble) organic compounds. The total amount of halogenated compounds and the level of polychlorinated biphenyls (PCB) were measured as well. The total level of chlorine in organic form ranged from 30 to 240 ppm, for bromine from 1.5 to 5.5 ppm, and for iodine from 0.5 to 25 ppm, all of which were measured in the oil phase. The results of this study showed that 2 to 10% of the chlorinated compounds were volatile, as were smaller fractions of the brominated and iodinated ones. From 5 to 50% of the chlorinated compounds remained after treatment with concentrated sulfuric acid. This chlorine exceeded chlorine in PCB by a factor of 1.5 to 5 in all samples tested. In both the lipids treated with sulfuric acid and those not so treated most of the chlorine could not be accounted for as known compounds. The halogenated organic compounds appeared to be widely distributed both geographically and among species, and no local sources could be inferred from the results of this study. A portion of these halogenated organic substances may have originated in the marine environment itself.

76-2885. Calvet, R.; Terce, M. (Stn. Sci. Sol, Cent. Nat. Rech. Agron., Versailles, France). **Adsorption de l'atrazine par des montmorillonites-Al. [Adsorption of atrazine on aluminum saturated montmorillonites.]** *Ann. Agron.* 26(6): 693-707; 2975. (22 references) (French)

The adsorption of atrazine was studied on aluminum-saturated montmorillonites. This adsorption appeared dependent on the thermic treatment of the mineral before adsorption was allowed to occur. The amount of atrazine adsorbed increased as the heating temperature increased. Adsorption reached a maximum when the temperatures were about 250-300°C. A detailed study of adsorption was done on the mineral periods heated to 300°C. Consideration of the effects of acidity, solvent composition, and the presence of mineral cations showed that adsorption did not occur through an ion exchange mechanism, that the aluminum plays an important role but must be hydroxylated for adsorption to occur, and that water molecules are directly involved in the adsorption mechanism. It was concluded that the atrazine molecules were primarily adsorbed on the external surfaces of the clay.

76-2886. Deelstra, H.; Power, J. L.; Kenner, C. T. (Univ. Inst. Antwerpen, Wilrijk, Belgium). **Chlorinated hydrocarbon residues in the fish of Lake Tanganyika.** *Bull. Environ. Contam. Toxicol.* 15(6): 689-698; 1976. (22 references)

The pesticide levels in the fish of northern Lake Tanganyika were monitored over a period of time; these fish are used as a source of protein by the surrounding populations. The fish were sun- or oven-dried, powdered, and analyzed by electron-capture gas chromatography. Except for fish caught near Minage, there was a general decrease in DDT and metabolites as the distance increased from Bujumbura or the head of the lake. The average total DDT level was more than 2-fold higher for two species which feed on plankton than for a single species which feeds on the clupeids. Trace amounts of endrin were found in some samples. The results on the sun-dried samples of fish used as a source of protein indicate that the amounts of chlorinated pesticides present are below the allowable limits set in most countries. On the basis of the fresh fish, assuming an average loss during drying of 75%, the values were all less than 0.6 ppm. Fish caught in the area of pesticide accidents too soon after the accident should not be eaten.

76-2887. Johnston, D. W. (Dep. Zool., Univ. Florida, Gainesville, FL 32611). **Organochlorine pesticide residues in uropygial glands and adipose tissue of wild birds.** *Bull. Environ. Contam. Toxicol.* 16(2): 149-155; 1976. (14 references)

Pesticide contents of uropygial glands were compared to those of adipose tissue depots taken from a large variety of wild birds of diverse habits and habitats. Fifty-three birds were examined, including aquatic, semiaquatic, and terrestrial species, piscivores, carnivores, insectivores, scavengers, long- and short-distance migrants, and non-migrants. PCBs were not detected in any samples. In

34 of the species sampled (77%), total DDTs were present in higher concentrations in adipose tissue than in the gland. For all species analyzed the mean ratio of total DDTs in adipose tissue to that in uropygial gland was 2.2:1. Only 17 samples contained dieldrin in either adipose tissue or gland or both. Overall the adipose tissue contained higher concentrations of total DDTs and dieldrin than did the uropygial glands with their lower lipid contents. According to this study, coupled with results of other investigators, it is apparent that the uropygial glands of birds function to excrete some chlorinated hydrocarbon pesticides.

76-2888. Collier, J. L.; Hurley, S. S.; Welborn, M. E.; Hansen, L. G. (Dep. Physiol. Pharmacol., Coll. Vet. Med., Univ. Illinois, Urbana, IL 61801). **Comparative residues of PCB components in the bald eagle and white leghorns.** *Bull. Environ. Contam. Toxicol.* 16(2): 182-189; 1976. (14 references)

A study was made of the comparative residues of PCB components in the bald eagle and white leghorns. A bald eagle found dead near a Springfield, Illinois lake was necropsied and several body tissues analyzed for organochlorine insecticide and PCB residues. Organochlorine residues detected were dieldrin, *p,p'*-DDE, DDD (TDE), and DDT. The liver contained the greatest amount of dieldrin, DDT, and DDD, while *p,p'*-DDE was most concentrated in the muscle. Lung and brain residues were similar but lower. PCBs were seen in the same tissues, with lower levels again in the lung and brain tissues, and highest concentrations in the liver tissue. The chicken study to which the eagle was compared was conducted in the form of chronic exposure to 20 ppm PCB. It is concluded that the eagle also received chronic exposure to PCBs, probably via the food chain. The average residue level in chicken fat was 124 ppm, while the chicken liver concentration was only 1.8 ppm. Organochlorine pesticide residues were similar to the levels found in eagle carcasses and brains by other studies. In this particular eagle, dieldrin exposure alone was not the cause of death.

76-2889. Marriage, P. B.; Saidak, W. J. (Res. Stn., Agric. Canada, Harrow, Ontario, Canada). **Simazine and linuron residues in peach orchard soil after repeated annual applications.** *Can. J. Soil Sci.* 56(2): 111-114; 1976. (14 references)

The persistence and downward movement of simazine and linuron residues in uncultivated orchard soil were studied after seven consecutive annual applications. The time needed for phytotoxic residues of these two herbicides to dissipate after application stopped was also measured. Herbicide treatments consisted of paraquat alone (1.1 kg/ha), paraquat combined with linuron or simazine at 4.5 kg/ha, and paraquat combined with linuron plus simazine at 2.2 kg/ha of each. A progressive buildup of herbicide residues did not occur after seven consecutive annual applications of relatively high rates of simazine and linuron to uncultivated orchard soil even though varying quantities of herbicide were detected in the spring and fall following the last two years of treatments. The downward movement of the herbicides did not extend beyond the 15-cm depth of soil. Neither compound had a prolonged persistence after application stopped, although linuron was more persistent than simazine.

76-2890. Onodera, S.; Ishikura, S.; Kagawa, Y.; Tanaka, K. (Fac. Pharm. Sci., Tokyo Univ. Tokyo, Japan). [**Chemical reactions of organic compounds in water treated with chlorine. 1. Formation of the P-O analogues from the P-S type of organophosphorus pesticides.**] *Eisei Kagaku (J. Hyg. Chem.)* 22(4): 196-205; 1976. (17 references) (Japanese)

The chemical reactions between minute amounts of organophosphorus pesticides as possible contaminants of agricultural effluent and chlorine-treated water were studied by TLC and GLC from the viewpoint of potable water sanitation. Many of the sulfur-containing organophosphorus pesticides reacted readily in water containing even 0.1 ppm free chlorine at room temperature, and at 0.6 ppm free chlorine the P-S or P-S2 type pesticides rapidly changes to P-O type compounds. Although no P-O compounds were obtained from dimeothoate and ethion, trichlorfon gave dichlorvos as the result of dehydrochlorination and isomerization. Of the P-O compounds formed from P-S compounds, malaoxon, paraoxon, and diazoxon were relatively stable in chlorine-treated water, however, methyl paroaxon, fenitroxon, and phosvel oxon were unstable due to hydrolysis. The oxidation of P-S compounds in chlorine-treated water was not affected by Mg, Ca, and trivalent Fe ions; however, it was inhibited by divalent Fe ion. The above findings indicate that the toxicity to aquatic organisms caused by mixing sulfur-containing organophosphorus pesticides with chlorine-treated water should not be neglected.

76-2891. Mazaev, V. T.; Golovanov, O. V.; Igumnov, A. S.; Tsay, V. N. (I. M. Sechenov First Moscow Med. Inst., Moscow, USSSR). **K voprosu o transformatsii olovoorganicheskikh soedineniy v vodnoy srede.** [**The transformation of organotin compounds in water.**] *Gig. Sanit.* 41(3): 17-20; 1976. (7 references) (Russian)

The decomposition of the organotin compounds bis-(tributyltin) oxide (TBTO; 2 4 mg/liter), tributyltin methacrylate (TBTM; 0.2 and 0.4 mg/liter), tin diethyldicaprylate (DEDKO; 1 and 2 mg/liter), tin dibutyldiisooctyl glycolate (DIOTGDBO; 1.5 and 3 mg/liter), and tin dioctyldiisobutylmaleate (DIBMDO; 3 and 4 mg/liter) was studied in water. Hydrolysis was found to be the determining factor in the decomposition of these compounds. The time necessary for 50% hydrolysis is distilled water 2.22 days for DEDKO, 1.14 day for DIOTGDBO, 3.25 days for DIBMIO, 18.20 days for TBTO, and 19.8 days for TBTM. The hydrolysis half-time was 1.73 days for DEDKO and 0.82 days for DIOTGDBO in distilled water with UV irradiation. The hydrolysis half-time was 1.50 day for DE-

DKO, 1.6 day for DIOTGDBO, 6.24 days for DIBMDO, 16.1 day for TBTO and 4.9 days for TBTM in pond water, compared to 2.47 days for DEDKO, 1.13 days for DIOTGDBO, and 1.9 day for DIBMDO in pond water containing sludge. In pond water with sand, the half-time was 1.3 day for DIOTGDBO, 4.7 days for DIBMDO, 4.15 days for TBTO, and 3.53 days for TBTM. The findings indicate that biochemical processes are involved only in the case of non-biocidal concentrations of trialkyltin compounds. The stability and adsorption of these compounds depended on the extent of alkylation and on the nature of the alkyl group.

76-2892. Rakhov, G. M.; Petrov, R. V.; Tsapko, V. V.; Vaniurikhina, L. N. (A. N. Marzeev Kiev Sci. Res. Inst. Gen. Communal Hyg., Kiev, USSR). **Vliianie primenenii iadokhimikatov i udobrenii v vodookhrannoi zone s istochnikimi iskusstvennogo napolneniia zapasov podzemnykh vod. [Effect of pesticides and fertilizers in water collection zones with artificial enrichment from underground water reservoirs.]** *Gig. Sanit.* 41(3): 101-102; 1976. (Russian)

The effect of pesticides and fertilizers applied to soil on the residue levels in soil and water was studied in water collection zones with artificial enrichment from underground water reservoirs. Atrazine, applied in a dose of 10 kg/ha, was found in the upper 15-20 cm soil layer without contaminating the groundwater. Metaphos (methyl parathion), used at a rate of 30 kg/ha, could not be detected in the soil 15 days after application. It caused no groundwater contamination. Granosan, introduced into the soil with dressed seeds, could not be detected due to the small quantities involved. Two, five, ten, and 20 days after application at a dose of 50 kg/ha, DDT residues of 0.2, 0.08, 0.05, and 0.01 mg/kg, respectively, were found in the upper 20 cm soil layer. Groundwater samples taken between days 2 and 30 contained no DDT. The absence of DDT in the groundwater is believed to be due to its low solubility. BHC residues of 0.00002-0.00102 mg/liter were found in certain rivers and wells, which indicates water contamination hazards due to BHC.

76-2893. Dyadicheva, T. V.; Pines, A. G.; Khokhol'kova, G. A. (Inst. Ind. Hyg. Occup. Dis., Kiev, USSR). **Gigiena truda pri fumigatsii pochvy emulsiey serougleroda. [Hygienic findings following soil fumigation with carbon disulfide.]** *Gig. Tr. Prof. Zabol.* 3: 44-45; 1976. (3 references) (Russian)

The health hazards involved in soil fumigation in vineyards using a 50% emulsion of carbon disulfide were studied. Carbon disulfide was introduced into the soil at depths of 30-50 cm at rates of 450-2,000 kg/ha. During the preparation of the sprayer and during fumigation, the carbon disulfide concentration in the working zone exceeded the MAC value by 2.5-6.7 fold. Immediately after fumigation the carbon disulfide concentration was twice the MAC value, but dropped to the latter level in 4 hours. No carbon disulfide was found in the air one day after treatment. The concentrations measured during fumigation at 25-100 m away did not exceed the MAC value. The carbon disulfide contamination of the hands of tractor drivers and other workers handling carbon disulfide was 0.009-0.16 mg/100 cm^3. The exposed workers showed no clinical symptoms of chronic poisoning. No carbon disulfide metabolites were found in their urine.

76-2894. Newsome, W. H. (Food Res. Div., Bureau Chem. Safety, Foods Directorate, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada). **Residues of four ethylenebis (dithiocarbamates) and their decomposition products on field-sprayed tomatoes.** *J. Agric. Food Chem.* 24(5): 999-1001; 1976. (7 references)

Ethylenebis (dithiocarbamates) and their decomposition products ethylenethiuram monosulfide, ethylenebis (isothiocyanate), and ethylenethiourea were determined on tomatoes after field spraying with four different formulations. The highest residues were found on crops treated with the manganese-containing products. After 14 days, 24-37% of the initial ethylenebis (dithiocarbamate) remained. The heating of homogenates of the treated crop material resulted in a 38-48% conversion to ethylenethiourea. (Author abstract reprinted by permission of the American Chemical Society)

76-2895. Chin, W. T.; Duane, W. C.; Meeks, J. R.; Stallard, D. E. (Diamond Shamrock Corp., T. R. Evans Res. Cent., Painesville, OH 44077). **Changes of thiofanox residues in potatoes resulting from storage and cooking.** *J. Agric. Food Chem.* 24(5): 1001-1004; 1976. (8 references)

Dacamox, the 5-15% granular formulation of thiofanox (P), 3,3-dimethyl-1- (methylthio)-2- butanone *O*-[(methylamino) carbonyl]oxime, was applied to potato crops in furrow at planting as an insecticide in the U.S. and Canada. Less than 0.5 ppm of the anticholinesterase carbamate residues derived from P was found in the tubers harvested from plots treated at the 3 lb (active ingredient) rate in the U.S. and Canada. These residues in potatoes may be reduced significantly by three mechanisms: (1) storage of the tubers at room temperature for 10-20 weeks reduced 48 to 97% of these residues through metabolic degradation; (2) baking and frying potatoes reduced the initial residues 50-90% due to hydrolysis of these residues; and (3) boiling potatoes reduced 30-60% of the initial residues due to water extraction. (Author abstract reprinted by permission of the American Chemical Society)

76-2896. Lewis, R. G.; Hanisch, R. C.; MacLeod, K. E.; Sovocool, G. W. (Anal. Chem. Br., Environ. Toxicol. Div., Health Effects Res. Lab., EPA, Research Triangle Park, NC 27711). **Photochemical confirmation of mirex in the presence of polychlorinated biphenyls.** *J. Agric. Food Chem.* 24(5): 1030-1035; 1976. (14 references)

A simple method for the determination of mirex in the presence of polychlorobiphenyls (PCBs) is reported.

The procedure depends on diethylamine-assisted photodegradation of interfering PCBs prior to measurement of the mirex by electron capture gas chromatography. An inexpensive 275-W sunlamp (spectral output > 280 nm) may be used as the irradiation source. Reductive dechlorination of the PCB results apparently through primary photoexcitation of the biphenyl, followed by hydrogen abstraction from both the alkyl and amino groups of the amine. The method has been successfully applied to human tissue extracts for the determination of mirex in the presence of Aroclor 1260 and other commonly occurring chlorinated pesticides. (Author abstract reprinted by permission of the American Chemical Society)

76-2897. Wolfe, N. L.; Zepp, R. G.; Doster, J. C.; Hollis, R. C. (Environ. Res. Lab., EPA, Athens, GA 30601). **Captan hydrolysis.** *J. Agric. Food Chem.* 24(5): 1041-1045; 1976. (20 references)

Captan [*N*-(trichloromethylthio)- 4-cyclohexene-1,2- dicarboximide] undergoes hydrolysis readily in water with a maximum half-life of 710 min. Over the pH range 2-6, the reaction is pH independent and the pseudo-first-order rate constant is $(1.8 \pm 0.1) \times 10^{-5}$ s^{-1}. Above pH 7 the reaction is pH dependent and the second-order rate constant for alkaline hydrolysis is $(5.7 \pm 0.4) \times 10^{2}$ M^{-1} S^{-1}. The products are 4-cyclohexene- 1,2-dicarboximide, carbon dioxide, hydrochloric acid, and sulfur. Folpet [*N*-(trichloromethylthio) phthalimide] and captafol [*N*-(1,1,2,2-tetrachloroethylthio)- 4-cyclohexene- 1,2-dicarboximide] hydrolyze at pH 7 with rates similar to that of captan. It is very likely that hydrolysis will be an important degradative pathway for these fungicides in the aquatic environment. (Author abstract reprinted by permission of the American Chemical Society)

76-2898. Ivie, G. W.; Bull, D. L. (Vet. Toxicol. Entomol. Res. Lab., ARS, USDA, College Station, TX 77840). **Photodegradation of *O*-ethyl *O*-[4-(methylthio)phenyl] *S*-propyl phosphorodithioate (BAY NTN 9306).** *J. Agric. Food Chem.* 24(5): 1053-1057; 1976. (8 references)

The ^{14}C-labeled organophosphorus insecticide, *O*-ethyl *O*-[4-(methylthio)phenyl] *S*-propyl phosphorodithioate (BAY NTN 9306), degraded rapidly when exposed to sunlight as deposits on cotton foliage, glass surfaces, or in water solution. The half-life of the compound was in each case less than 2 days. Exposure of water solutions of the insecticide to > 280 nm artificial light resulted in very rapid degradation (half-life < 2 h) to the same major photoproducts as were generated by exposure to sunlight. Degradation pathways included oxidation of the methylthio sulfur to sulfoxide and sulfone derivatives, hydrolysis of the phosphorus-*O*-phenyl ester, oxidative desulfuration of the P%S moiety, and undefined transformations leading to highly polar products that increased in quantity with time of exposure. When ^{14}C-labeled photoproducts of BAY NTN 9306 were orally administered to rats, they were rapidly excreted and no appreciable radiocarbon was retained in body tissues. (Author abstract reprinted by permission of the American Chemical Society)

76-2899. Archer, T. E. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Effects of light on the fate of carbofuran during the drying of alfalfa.** *J. Agric. Food Chem.* 24(5): 1057-1062; 1976. (11 references)

Carbofuran and related compounds as residues on alfalfa hay exposed to drying by sunlight, ultraviolet light, and air in the dark under controlled conditions were investigated using gas-liquid chromatography (GLC) and thin-layer chromatography (TLC) for the purpose of determining the fate, form, and removal of these residues from the hay. Maximum loss of carbofuran and related compounds calculated as total carbofuran occurred approximately 10 days after application from all the samples. Maximum losses of residue from lot I, lot II, and lot III were 83.6, 81.3, and 89.8%, respectively. Hydroxycarbofuran, 3-oxocarbofuran, 3,7-diol, and the 3-keto-7-phenol increased in all of the lots. The hydroxycarbofuran increased most dramatically in the dark drying experiment. This increase was evident because less volatility with plant moisture occurred as it was formed since the percent moisture loss from the alfalfa during days 2 to 10 in the dark experiment was less than in the ultraviolet light and sunlight experiments. (Author abstract reprinted by permission of the American Chemical Society)

76-2900. Cone, W. W.; Maitlen, J. C. (Irrigated Agric. Res. Extension Center, Prosser, WA 98902). **Systemic activity of aldicarb against twospotted spider mites on hops and aldicarb residues in hop cones.** *J. Econ. Entomol.* 69(4): 533-534; 1976. (2 references)

Residues of aldicarb in fresh and dried hop cones at harvest were studied. A 10% granular formulation of aldicarb was applied around hills of hops at 8 different treatment rates. Two of these rates were single applications at 3.6 and 7.2 g AI/hill. The other 6 treatments were double applications 4 weeks apart, at rates of 1.8 and 1.8, 3.6 and 1.8, 3.6 and 3.6, 5.4 and 1.8, 7.2 and 1.8, and 7.2 and 3.6 g AI/hill. Irrigation followed within 12 hr and lasted for 24 hr. Applications in 4 dm deep trenches around hop crowns provided control of *Tetranychus urticae* Koch at 7.2 g AI/hill. Residues of aldicarb and its toxic metabolites ranged from 4.7 to 15.6 ppm on dried hop cones and 2.9 to 12.7 on fresh hop cones. The drying process and the concentration of hop cone material account for the higher residue in dry than in fresh hop cones.

76-2901. Anpalov, V. A. (Siberian Sci. Res. Inst. Farm Chem., Siberian Br. V. I. Lenin All-Union Acad. Agric. Sci., Novosibirsk, USSR). **Prodolzhitel'nost' sokhraneniya pochvennykh gerbitsidov v vyshchelochennykh chernozemakh TsChO. [Persistence of soil herbicides in leached chernozems of the Central Chernozem Region.]**

Khim. Sel. Khoz. 12(9): 53-55; 1974. (13 references) (Russian)

The persistence of the soil herbicides season (1-8 and 10 kg/ha), falone (1-10 and 15 kg/ha), 2,4-D amine salt (1-5 kg/ha), pyramin (pyrazon, 1-3, 5, and 8 kg/ha), solan (1-8 and 10 kg/ha), TCA (1-8, 30 and 60 kg/ha), dalapon (1-15, 20, 30 and 60 kg/ha), eptam (EPTC, 1-8, 10, and 20 kg/ha), triethazine, neburon, prometryne, atrazine, simazine, and diuron was studied in slightly leached chernozem with pH 6.8-7 and 5% humus after had spraying of solutions in mid-June. Most herbicides were active in the soil for at least 3 months. Season, 2,4-D amine salt, falone, solan, dalapon, and small doses of TCA disappeared from the soil in two months. When used in high doses, these preparations persisted in the upper 0-10 cm soil layer for 5-11 months. Triazines and urea derivatives were most persistent, their residues were detectable in the soil for 2-2.5 months after the introduction of small doses (1-3 kg/ha), and residues were found over one year after the use of high doses.

76-2902. Cerutti, G.; Zappaviana, R.; Gerosa, A.; Proverbio, A. (Ist. Indust. Agrar., Univ. Milano, Milan, Italy). **Residui di antiparassitari clororoganici in latti di vacca e di pecora, jogurts e creme di affioramento e di siero. [Chlorinated pesticide residues in sheep's and cow's milk, in yogurt, and in cream.]** *Latte* 3: 547-552; 1975. (16 references) (Italian)

High-temperature sterilized (HTST) and ultra high temperature sterilized (UHT) cow's milk, sheep's milk, plain and fruit flavored yogurts, and separated cream and whey cream from 9 milks intended for cheesemaking were examinated for 13 chlorinated pesticides. A total of 48 samples was assayed. Chlorinated insecticide residues amounted to 7-73 ppb in the 10 cow's milk samples (whole milk basis), 4-32 ppb in the 10 sheep's milk samples (whole milk basis), 21-61 ppb in the 4 samples of plain yogurt (whole yogurt basis), 6-95 ppb in the 6 samples of flavored yogurt (whole yogurt basis), 41-178 ppb in the 9 separated cream samples (fat basis), and 0-269 ppb in the 9 samples of whey cream (fat basis). DDT and its derivatives were not detected in 7 HTST and UHT milks, in 8 sheep's milks, in 2 plain and 4 flavored yogurts, and in 1 samples of whey cream. (From author summary).

76-2903. Lock, J. W.; Solly, S. R. B. (Wallaceville Anim. Res. Cent., Res. Div., Min. Agric. Fish., Private Bag, Upper Hutt, New Zealand). **Organochlorine residues in New Zealand birds and mammals. 1. Pesticides.** *N. Z. J. Sci.* 19(1): 43-51; 1976. (19 references)

Samples of wildlife (627) comprising 61 species of birds and 16 species of mammals were analyzed for DDE, TDE, DDT, hexachlorobenzene (HCB), and lindane. Specimens were collected between 1966 and 1973 from the 3 main islands of New Zealand and from the Chatham, Kermadec, and Snares groups of islands, Campbell Island, and Norfolk Island. In birds, DDE was the predominant residue. Total DDT concentrations in muscle tissue varied according to habitat and feeding habits, and the residues decreased in the following order: terrestrial carnivores (3.28 mg/kg), terrestrial omnivores (2.k. mg/kg), freshwater carnivores (1.63 mg/kg), estuarine carnivores (0.59 mg/kg), terrestrial insectivores (0.40 mg/kg), marine carnivores (0.31 mg/kg), and inland herbivores (0.13 mg/kg). HCB was present in the muscle of harrier hawks in amounts up to 0.08 mg/kg. In the fat of terrestrial mammals, total DDT concentrations decreased in the order: wild pigs (2.42 mg/kg), hares (0.80 mg/kg), and rabbits (0.03 mg/kg). Chamois, deer, and wild goats all contained mean levels of less than 0.01 mg/kg. The livers of three dolphins and five seals contained mean total DDT levels of 1.26 and 5.28 mg/kg, respectively. HCB was not detected in any mammal, and lindane was not detected in either birds or mammals.

76-2904. Crueger, G.; Roepsch, A.; Rothert, H. (Biol. Bundesanst., Abt. Pflanzenschutzmittel und -geraete, Braunschweig, Germany). **Rueckstandsprobleme bei der Anwendung von Methylbromid zur Bodenbegasung auf Gemueseflaechen. [Residue aspects of soil fumigation with methyl bromide on vegetable growing areas.]** *Nachrichtenbl. Dtsch. Pflanzenschutzdienst (Braunschweig)* 28(6): 81-84; 1976. (20 references) (German)

Legislation regarding the use of methyl bromide for soil fumigation is reviewed. Residual aspects of the chemical when applied in areas used for growing vegetables is discussed. Literature information regarding studies of bromine content in vegetables and soils after soil fumigation with methyl bromide is reviewed. Methods which may aid in reducing bromine residue are discussed. It is concluded that soil fumigation with methyl bromide may result in bromine residues in vegetables in excess of tolerance limits (lettuce, 50 ppm; all other vegetables, 30 ppm). It is urged that application of methyl bromide for soil fumigation of areas used for growing vegetables be prohibited.

76-2905. Sugaya, H.; Kawanishi, A.; Wakatsuki, S. (Hiraga Hosp., Hiraga, Akita, Japan). **[Results of survey on pesticide residues in the human body.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 47; 1976. (Japanese)

According to Sugaya's findings, the β-BHC content of mother's milk was 6.227 ppm (max.), 0.917 ppm (min.), and the average was 2.313 ppm on a fat basis. The DDE content was 3.591 ppm (max.), 0.773 ppm (min.), and the average 1.728 ppm. These levels were lower than those in the preceding year. The adipose tissue contained β-BHC at 6.424 (max.), 0.764 (min.), and an average of 2.991 ppm, a little higher than that in the preceding year (1% ppm). The DDE content of adipose tissue was 4.128 (max.), 0.723 (min.), and average of 1.776 ppm, also higher than that in the preceding year. Residues of β-BHC and DDE were found in all tissues examined, especially higher in the following organs, in decreasing order: kidney, liver,

spleen, and brain. According to Kawanishi's findings, residues of total BHC and total DDT in adipose tissue of 45 specimens were 3.032 ppm (total BHC), 10.582 ppm (total DDT), and 0.165 ppm (dieldrin). When comparing the results of recent few years' findings it could be concluded that residues of total BHC did not show a yearly change and total DDT residue showed an increasing tendency, even though slight.

76-2906. Uchida, Wakatsuki, S. (Res. Inst. Rural. Med., Fac. Med. Chiba, Univ., Chiba, Japan). [**Results of survey on pesticides in human body.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 47-48; 1976. (Japanese)

Translocation of organochlorine pesticide residues was surveyed from the mother's body to the fetus. The average amounts of β-BHC residue in blood, umbilical cord, in the mother's body, and in the placenta were 1.9, 5.7, and 6.8 ppb, respectively, and that of *p,p'*-DDE residue was 11.5, 5.5, and 4.3 ppb, respectively. In addition, the results of a survey on rural inhabitants showed β-BHC and *p,p'*-DDE in all specimens.

76-2907. Kawanishi, A.; Asanuma, S.; Suzuki, A. (Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Studies on organochlorine pesticide residues in the human body, Part 7.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 496-497; 1976. (Japanese)

Results of determinations were described and comparisons made of organochlorine pesticide residues in human fat samples (30 samples, from men mostly between 45 and 85 years of age and 48 samples from women in the same age group). Residues of α- and β-BHC, *p,p'*-DDT, and *p,p'*-DDE were detected in all samples, and dieldrin was detected in 92.3% of all samples. The average concentrations were 0.098 ppm α-BHC, 2.655 ppm β-BHC, 0.009 ppm lindane, 2.762 ppm total BHC, 1.634 ppm *p,p'*-DDT, 0.072 ppm *o,p'*-DDT, 9.329 ppm *p,p'*-DDE, 11.035 ppm total DDT, and 0.120 ppm dieldrin. These results indicated strong persistence of organochlorine pesticides. The highest level found was 46.544 ppm. The residue levels were higher in elderly men (older than 45), showing the same tendency as in the past. No relationship was found between the amount of residue and thickness of the subcutaneous adipose tissue or body weight. Comparison of the average amounts of residues during past 6 years showed: total BHC 6.160 ppm in 1971, 3.973 ppm in 1972, 2.659 ppm in 1973, 3.066 ppm in 1974, 3.032 in 1975, and 2.762 ppm in 1976. Total DDT level were 11.894, 5.599, 5.929, 7.724, 10,582, and 11.035 ppm, 3.032 ppm in the same years.

76-2908. Suzuki, Y.; Sugaya, H.; Sasaki, S. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan). [**Organochlorine pesticide residues in humans 1975.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 498-499; 1976. (Japanese)

Results of determinations of organochlorine pesticide residues in human milk and human adipose tissue from 1970 to 1975 were described and a comparison of the data between tumor-bearing patients and other patients was carried out. The residual amounts in human milk were as follows: β-BHC was detected in all samples of milk, averaging 2.442 ppm (0.650, 3.200, 6.105, 2.901 and 2.33 in 1970, 1971, 1972, 1973, and 1974, respectively) on a milk fat basis. *p,p'*-DDE was also detected in all the samples, averaging 2.353 ppm (2.200, 2.480, 2.768, 2.075, and 1.728 in the same years as above). Dieldrin was detected in 66.76% of the samples, averaging 0.230 ppm. The amounts in human adipose tissue were as follow: β-BHC and *p,p'*-DDE were detected in all the samples, averaging respectively 2.477 and 2.321 ppm on a tissue basis, showing a slight tendency to increase, and the dieldrin quantity was 0.254 ppm, also showing an increasing tendency. The residues of β-BHC and total DDT in the fat of tumor-bearing patients (39 persons) were 2.375 and 2.746 ppm, respectively, a little higher than in the fat of other patients (27 persons) with 2.228 and 2.694 ppm, respectively. Residues of dieldrin were lower in the former (0.159 ppm) than in the latter (0.187 ppm).

76-2909. Nakamura, Y.; Tsutsui, J.; Suzuki, H.; Ito, Y.; Nagao, S.; Miwa, H. (Lab. Rural Med., Chusei Gen. Hosp., Mie, Japan). [**Organochlorine pesticide residues in mothers' blood and in the placenta.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 500-501; 500-501; 1976. (1 reference) (Japanese)

Results of determinations of organochlorine pesticide residues in blood of recently delivered women and that of their placentas were described. Seven of the women were farmers and ten non-farmers. Traces of α-BHC and *p,p'*-DDT were detected in all the samples. δ-BHC was detected in trace amounts in 49% of samples; *p,p'*-DDD (TDE) was not detected; and β-BHC and *p,p'*-DDE could be determined. The average amounts of α-BHC, β-BHC and *p,p'*-DDE were 0.6, 10.0, and 5.0 ppb in blood, respectively, and 0.7, 12.0, and 3.1 ppb in placenta, respectively. Correlations between the amounts in blood and in placenta were found only for β-BHC, not for α-BHC and *p,p'*-DDE. Relatively higher amounts were seen in non-farming wives. The reason of detecting the residues only in traces was thought to be the small amount of sample.

76-2910. Konno, N.; Kinebuchi, H.; Yamauchi, T. (Sch. Pub. Health, Fukushima Prefect. Med. Coll., Fukushima, Japan). [**Residues of phosvel in adipose tissue of domestic fowl.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 506-507; 1976. (Japanese)

It was previously reported that phosvel (leptophos) caused delayed nerve disturbances in adult domestic fowl. It was now found that phosvel persists for a relatively long period in the fat of the fowl body. Three groups (8 per group) of 12-month-old adult hens (White leghorn) were

given single doses of salad oil, 250 mg of phosvel/kg b.w. dissolved in salad oil, or 1250 mg of phosvel/kg b.w. in salad oil. After observation for 7, 14, or 21 days, they were sacrificed to determine the residues of phosvel in their adipose tissue. Phosvel was qualitatively detected in controls indicating contamination of the henhouse. The highest residual amount in the 1250 mg/kg group was reached at 11.00 ppm on the 7th day; 5.44 ppm was detected on the 14th day, and 1.31 ppm on the 21st day. The findings in the 250 mg/kg group were 4.18, 1.58, and 0.71 ppm (fat basis), respectively, on the 7th, 14th, and 21st days. No nerve disturbance was recognized in treated hens or controls. The determination of phosvel in adipose tissue was carried out by extracting and cleaning up, purifying as designated by the FDA method, and determining it gas-chromatographically with FPD, without inferference by other peaks.

76-2911. Chiba, M.; Kato, S.; Yamamoto, I. (Sch. Agric. Chem., Tokyo Univ. Agric., Tokyo, Japan). **Metabolism of *O,O*-dimethyl *O*-(4-cyanophenyl) phosphorothioate and *O*-ethyl *O*-(4-cyanophenyl)phenyl phosphonothioate in bean plants and degradation in soil.** *J. Pestic. Sci.* 1(3): 179-191; 1976. (10 references)

Studies were conducted to determine whether the cyanophenol moiety distinguishes Cyanox (cyanophos) and Surecide (cyanophenphos) from other organophosphorus insecticides, and whether the metabolic and degradative patterns of these insecticides in plants and soil differ. Plants were treated by root uptake from water culture, dipping of leaves, topical applications, and injection. When these compounds were metabolized by bean plants, the nitrile group was not involved. However, a large quantitative difference in the rate of metabolism between the two compounds was noted. Cyanox was rapidly lost from treated leaves by volatilization and metabolism with a half-life of one day. Surecide was much more persistent; its half-life was about two weeks. Cyanoxon, the toxic metabolite of Cyanox, was seen as a transient intermediate to further degradation products; surecide-oxon was not observed. Desalkyl compounds and 4-cyanophenol were the major metabolites from both compounds. Photodegradation was not a significant factor. Cyanox is absorbed from water culture by bean plants; there is no uptake of Surecide under these same conditions. Cyanox dissipates faster from the soil than does Surecide, giving 4-cyanophenol and desalkyl compounds. Surecide persists longer and yields mainly 4-cyanophenol.

76-2912. Ogawa, K.; Tsuda, M.; Yamauchi, F.; Yamaguchi, I.; Misato, T. (Inst. Physical and Chem. Res., Wako, Saitama, Japan). **Metabolism of 2-*sec*-butylphenyl *N*-methylcarbamate in rice plants and its degradation in soils.** *J. Pestic. Sci.* 1(3): 219-229; 1976. (15 references)

The absorption, translocation, and metabolism are reported of Bassa (BPMC) in rice plants, its degradation in soils, and estimations for biological activity of its metabolites. On rice plants ^{14}C-Bassa was absorbed from roots and leaves and translocated to an upper part and an apical part of a leaf. Much of the chemical was rapidly lost by surface evaporation. In the plants Bassa was oxidized at the *sec*-butyl and *N*-methyl groups and the 4-position of the aromatic ring. These oxidized metabolites were then conjugated with β-glucose or other substances. 2-(1-Methyl -2- hydroxypropyl)phenyl *N*-methylcarbamate was the major metabolite. Degradation of ^{14}C-Bassa in soil produced 2-(1-acetylethyl)phenyl *N*-methylcarbamate, 2-*sec*-butylphenylcarbamate, and 2-*sec*-butylphenol. Sixteen to 33% of the radioactivity was unextractable as soil-bound residues 30 days after treatment. All metabolites, with one exception, were less toxic than the parent compound based on anticholinesterase activity tests. This one, 2-*sec*-butyl 4-hydroxyphenyl *N*-methylcarbamate was only produced as a conjugated form in rice plants.

76-2913. Eberhardt, L. L.; Gilbert, R. O.; Hollister, H.; Thomas, J. M. (Ecosystems Syst. Dep., Battelle Pacific Northwest Labs., Richland, WA 99352). **Sampling for contaminants in ecological systems.** *Environ. Sci. Technol.* 0(9): 917-925; 1976. (71 references)

A framework for designing schemes to sample for contaminants requires a clear statement of objectives, selection of an approproate model and error system, and should yield cost-effective ways to sample to meet specific objectives. After reviewing five classes of models that might be used in studies of contaminants it is concluded that a universal model is presently out of reach, but that existing systems will serve various practical purposes. A rationale for choice of error structure leads to such frequency distributions as the gamma and log-normal; therefore, ways devised were of testing the major assumption involved—that of constancy of the coefficient of variation. The above framework yields a revised optimum allocation and sample-size formula. A study of models leads to recommending the use of body size (length, weight) as an auxiliary variable in sampling for either estimation (double sampling) or comparisons (analysis of covariance). A technique now used in industrial experimentation is recommended for sampling for model building (or model fitting), and it is suggested that techniques in use in economic geology also be considered for adaptation. (Author abstract reprinted by permission of the American Chemical Society)

76-2914. White, D. H. (Fish Wildl. Serv., U.S. Dep. Interior, Patuxent Wildl. Res. Cent., Laurel, MD 20811). **Residues of DDT and DDE in livers of waterfowl, Northeastern Louisiana—1970-71.** *Pestic. Monit. J.* 10(1): 2-3; 1976. (9 references)

A study was conducted to determine the levels of DDT and DDE in the livers of 10 species of waterfowl collected in Louisiana from 1970 to 1971. Livers of 48 of 50 specimens contained detectable levels of DDT and/or DDE. DDT residues ranges from 0.01 to 10.90 ppm; DDE

levels ranged from 0.02 to 38.69 ppm. (Author abstract by permission)

76-2915. Stendell, R. C.; Ohlendorf, H. M.; Klaas, E. E.; Elder, J. B. (Fish Wildl. Serv., U.S. Dep. Interior, Patuxent Wildl. Res. Cent., Laurel, MD 20811). **Mercury in eggs of aquatic birds, Lake St. Clair—1973.** *Pestic. Monit. J.* 10(1): 7-9; 1976. (19 references)

Eggs from four species of aquatic birds inhabiting waterways of the Lake St. Clair region were collected in 1973 and analyzed for mercury. Species analyzed were mallard ducks (*Anas platyrhynchos*), common terns (*Sterna hirundo*), black-crowned night herons (*Nycticorax nycticorax*), and great egrets (*Casmerodius albus*). Mallard eggs contained relatively low residue levels, < 0.05-0.26 ppm, and common tern eggs contained the highest residues, ranging up to 1.31 ppm. Mercury levels in the eggs were appreciably lower than those in the same species in 1970. The declines are attributed to the 1970 restrictions placed on industrial discharges of mercury into the St. Clair and Detroit Rivers. (Author abstract by permission)

76-2916. White, D. H. (Fish Wildl. Serv., U.S. Dep. Interior, Patuxent Wildl. Res. Cent., Laurel, MD 20811). **Nationwide residues of organochlorine in starlings, 1974.** *Pestic. Monit. J.* 10(1): 10-17; 1976. (7 references)

Organochlorine residues in starlings (*Sturnus vulgaris*) from 126 collection sites were monitored during the fall of 1974. DDE, DDT, polychlorinated biphenyls (PCBs), and benzene hexachloride were present in all samples. Dieldrin, heptachlor expoxide, hexachlorobenzene, and oxychlordane were present in approximately 97 percent of the samples. DDE, dieldrin, and PCB residues in starlings were significantly lower than they had been in 1972. (Author abstract by permission)

76-2917. Carrasco, J. M.; Cuant, P.; Martinez, M.; Primo, E. (Tech. Sch. Agric. Eng., Valencia, Spain). **Pesticide residues in total diet samples, Spain—1971-1972.** *Pestic. Monit. J.* 10(1): 18-23; 1976. (12 references)

Average pesticide residue levels were determined for the 17 main food groups in the average Spanish diet. Using these levels and the estimated average intake of these foods, authors computed an individual's average daily consumption of pesticides from each of these food groups and her/his total diet. Foods were acquired over a 1-year period from the market of Valencia, a city that gets supplies from an agricultural area where pesticide consumption is appreciably higher than that of the rest of the country. Thus average residue levels found must be higher than the national average. Except for fruits and vegetables, the different items composing each food group were sampled in proportion to the amount consumed in the average Spanish diet. Foods forming each group were homogenized into composite samples. All foods were analyzed raw. The most frequently detected pesticides were DDT and BHC. Malathion was detected at levels less than 0.10 ppm in some samples of vegetable oils, pears, and apples. DDT and BHC levels varied from undetectable to amounts less than 1.0 ppm. Highest levels were found in lard. An individual's average daily intake of pesticides was calculated to be 78 μg DDT, a sum which includes residues of *o,p'*-DDT, *p,p'*-DDT, and *p,p'*-DDE, and 13.8 μg γ-BHC. These levels are much lower than maximum acceptable daily limits established by the United Nations Food Agricultural Organization and World Health Organization. (Author abstract by permission)

76-2918. Tanita, R.; Johnson, J. M.; Chun, M.; Maciolek, J. (Stanford Res. Inst., Arlington, VA). **Organochlorine pesticides in the Hawaii Kai Marina, 1970-1974.** *Pestic. Monit. J.* 10(1): 24-29; 1976. (12 references)

Sediments, water, and oysters from the receiving waters of the Hahaione Valley, a suburban development in southeastern Oahu, Hawaii, were analyzed for organochlorine pesticidal compounds. The insecticides dieldrin, α- and γ-chlordane, and *p,p'*-DDT were found in the study site environment. Levels were in the low ppb range for oysters and sediments and in the low ppt range for water. During the past several years dieldrin residues in the marine study site have increased, even though the only activity known to influence pesticide levels in the valley is the chronic treatment for subterranean and dry wood termites. If present trends continue, dieldrin may pose a threat to biota of the aquatic environment. Findings have shown that residue levels of dieldrin and *p,p'*-DDT in the sediments are within the LD50 (median lethal dose) range for estuarine fish and thus may have a deleterious effect on bottom-feeding organisms. According to present standards of the Food and Agricultural Organization/World Health Organization, pesticide residue levels within the study site do not appear to constitute a health hazards to humans. (Author abstract by permission)

76-2919. Webster, G. R. B.; Reimer, G. J. (Pestic. Res. Lab., Dep. Soil Sci., Univ. Manitoba, Winnipeg, Manitoba, Canada). **Cold storage degradation of the herbicide metribuzin in field soil samples awaiting analysis.** *Pestic. Sci.* 7(3): 292-300; 1976. (14 references)

In conjunction with a study of herbicide degradation in the field, metribuzin (4-amino-6-*tert*-butyl- 4,5-dihydro-3- methylthio-1,2,4- triazin-5-one) was shown to be degraded at -37 ± 5°C in soil samples awaiting analysis. Products of this degradation process include the known derivatives DADK (6-*tert*-butyl- 2,3,4,5-tetrahydro-1,2,4-triazine- 3,5-dione) and DK (4-amino-6- *tert*-butyl-2,3,4,5-tetrahydro- 1,2,4-triazine-3,5-dione) and these products themselves have been shown to be degraded further under the same storage conditions. Loss of the herbicide can be approximated using half order kinetics with respect to metribuzin; however, loss of both previously identified metabolites is most rapid when metabolite concentrations are highest. Assuming half order kinetics,

samples of Almasippi very fine sandy loam containing metribuzin (0.5 mg/kg) can be expected to lose 50% of the herbicide in 282 days at -37°, a period which is short enough to affect residue analysis results significantly should samples be stored for extended lengths of time prior to analysis. Implied in these results is the desirability of immediate analysis following collection of samples; otherwise rates of less during storage must be determined to allow adjustment of results to compensate for residue losses in samples awaiting analysis. (Author abstract by permission)

76-2920. Yamagishi, T. (Div. Study Milk and Meat, Public Health Res. Lab., Tokyo Metrop. Off., Tokyo, Japan). [**The status of residues of DDT and BHC in human and cow's milk.**] *Kankyo Osen (Iwayuru Kogai) ni Kansuru Chosa Kenkyu (Rep. Stud. Environ. Pollut.)* 2: 120-125; 1975. (24 references) (Japanese)

A follow-up study was performed on residues of BHC and DDT in human milk and cow's milk following the banning of these compounds. Residues were determined monthly in raw and market cow's milk from October, 1970 to March, 1975. The levels of BHC and DDT showed a steady decline from year to year, as indicated by an inverse negative correlation between the concentrations and the number of years that elapsed since the ban. For example, the average total BHC values (fat basis) were 1.409 ppm in 1970, 0.311 ppm in 1972, and 0.198 ppm in 1974. The rate of decline for DDT and dieldrin concentrations was much lower than that for total BHC. This was apparently due to the fact that the levels of these compounds in pasturage were still high, and the DDT content in imported feed was also high. In contrast the average total BHC and DDT contents remained virtually unchanged: the average total BHC contents were 2.56 ppm in 1971, 2.85 ppm in 1973, and 2.16 ppm in 1974 (fat basis). Gamma-BHC and dieldrin showed a tendency to decrease, although very slowly. This appears to be due to biological concentration in humans, who are at the top of the biological food chain.

76-2921. Fukano, S. (Div. Study Nutr., Public Health Res. Lab., Tokyo Metrop. Off. Tokyo, Japan). [**Residues of PCT, PCB, and DDE in human blood.**] *Kankyo Osen (Iwayuru Kogai) ni Kansuru Chosa Kenkyu (Rep. Stud. Environ. Pollut.)* 2: 184-187; 1975. (Japanese)

Blood samples were collected from 19 men and 8 women at the Tokyo Metropolitan Office in 1973. The blood was extracted with hexane after alkaline hydrolysis, and the extract was analyzed by ECD-gas chromatography after clean-up with sulfuric acid and a multilayer column. It was found that the average *p,p'*-DDE residue was 11.2 ppb (range of 3.2-19.6 ppb, s.d. 4.5 ppb). Because *p,p'*-DDT was changed to *p,p'*-DDE by hydrolysis, the values obtained for *p,p'*-DDE were nearly equal to the total DDT value.

76-2922. Momotani, H.; Ishizu, S.; Sato, M.; Morinobu, S. (Sch. Public Health, Tokyo Women's Med. Coll., Tokyo, Japan). [**Bromine determination in urine of persons exposed to methyl bromide.**] *Sangyo Igaku (Jpn. J. Ind. Health)* 18: 141; 1976. (Japanese)

Bromine contents were determined in urine samples taken from 52 persons (24 men and 28 women, average age 46.6 years) engaged in handling methyl bromide. The average bromine content was 6.5 mg/l, with a standard deviation of 2.5 mg/l, and with a nearly logarithmic normal distribution. The 95% confidence limit was 10 mg/l. When the bromine contents were classified by workplace, a correlation was found between the urine levels and the concentration of bromine in ambient air. For example, an average content of 23 mg/l was found for an atmospheric concentration of 4-5 ppm. It was considered that the bromine contents in the urine of methyl bromide handling persons had no relationship with their age and the duration of handling, and that the level reflected the environmental concentration of bromine. In the present study, no subjective symptoms were noted at the urinary bromine levels found.

76-2923. Bradt, P. T.; Herrenkohl, R. C. (Dep. Biol., Lehigh Univ., Bethlehem, PA 18105). **DDT in human milk: what determines the levels?** *Sci. Total Environ.* 6(2): 161-163; 1976. (7 references)

Fifty-five samples of human milk from women in eastern Pennsylvania were analyzed for DDT and its metabolites. Fifty-four of the samples contained DDT, DDE, and/or DDD (TDE); the mean total DDT derived from the total of 55 samples was 0.114 μg/g. Twenty-six of the samples exceeded the U.S. FDA tolerance (0.10 ppm) for total DDT in cows' milk and 35 samples exceeded the FDA tolerance (0.05 ppm) for DDE in cows' milk. Five samples of cows' milk contained DDT and metabolites at a mean level of 0.007 μg/g, and no detectable DDT or metabolites were found in various samples of infant formula. Higher levels of total DDT in the human milk were statistically related to a high-calorie diet, cigarette smoking, self-reported use of nonpersistent pesticides, and fewer children nursed.

76-2924. Geluso, K. N.; Altenbach, J. S.; Wilson, D. E. (Dep. Biol., Univ. New Mexico, Albuquerque, NM 87131). **Bat mortality: pesticide poisoning and migratory stress.** *Science* 194(4261): 184-186; 1976. (25 references)

Organochlorine residues in the fat of young Mexican free-tailed bats, *Tadarida brasiliensis*, reached the brain and caused symptoms of poisoning after the fat mobilization that takes place during migratory flight was simulated. These chemical body burdens were obtained naturally under free-living conditions at the maternity roost. The data obtained supports the hypothesis that pesticides have contributed to recent declines in populations of this bat. (Author abstract by permission)

76-2925. Tsukano, Y. (Natl. Inst. Agric. Sci., Minis. Agric. For., Tokyo, Japan). [**Dynamics of organochlorine pesticides in soil.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 297-301; 1976. (47 references) (Japanese)

In a description of the importance of pesticides applied to drifted onto or otherwise transported onto soil, and their adverse effects on the environment including crops and cows' milk, detailed consideration was given to BHC, DDT, dieldrin, PCP, PCNB, and tetrachloroisophthalonitrile. The dynamic status and especially the dissipation of pesticides was analyzed from the viewpoints of adsorption and translocation of pesticide molecules, translocation of the molecules by carriers, absorption by plants, and alteration of the pesticide itself by photochemical, chemical, and biological reactions. The four modes of chlorine elimination from organochlorine pesticides are dehydrochlorination, dechlorination, and replacement by a hydroxyl group or a methylthio group. Transformation of each of the six organochlorine pesticides was described, citing many reports. Conditions for accelerating the disappearance of organochlorine pesticide residues in soil were discussed.

76-2926. Takase, I. (Nippon Tokushu Noyaku Seizo Co. Ltd., Tokyo, Japan). [**Dynamics of organophosphorus pesticides in soil.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 302-306; 1976. (11 references) (Japanese)

Organophosphorus pesticides not only reach the soil by falling from plants treated with organophosphorus pesticides as insecticides and by direct introduction into soil for controlling soil insects, but they are also applied to plants as fungicides. The latter use, especially on rice plants, results in high residual amounts in soils in Japan. The residues absorption transformation, and retention of organophosphorus pesticides by plants and soil were described and discussed. In general the lifetime of organophosphorus pesticides in soil is shorter than other kinds of pesticides; however, considerable differences in their lifetimes were observed depending on the nature and condition of the soil. Generally, organophosphorus pesticides are not leached; however, their chemical structures affect the leaching considerably. Of the organophosphorus pesticides, those having P%S bond, and C-S-C bonds are oxidized in soil, although they retain their anticholinesterase activity and thus their insecticidal activity. Oxidation is greatly affected by the nature and condition of the soil. The absorption of organophosphorus pesticides from soil, plants, and crops was described in detail using disulfoton as an example. Although organophosphorus pesticides are generally degraded relatively rapidly in soil, giving no great problems in the environment and in crops, their development over a broader range of structure necessitates continued studies in these fields.

76-2927. Shindo, N. (Fac. Agric., Meiji Univ., Kawasaki, Kanagawa, Japan). [**Dynamics of organosulfur fungicides in the environment.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 307-311; 1976. (49 references) (Japanese)

Organosulfur fungicides now in use are classified into three groups: dimethyldithiocarbamic acid derivatives such as ferbam and ziram, their oxidation products such as thiram, and ethylenebis-dithiocarbamic acid derivatives such as nabam, zineb, maneb, mancozeb, and propineb. The degradation pattern of organosulfur pesticides and the formation of thyroma-inducing ethylenethiourea (ETU) from ethylenebis-dithiocarbamic acid derivatives by chemical reaction were described. The dynamics of organosulfur fungicides in plants and soil were described, placing emphasis on the formation of ETU. Absorption and metabolism of ETU in plants were included. In this connection, the fate of organosulfur fungicides in mammals was also discussed. The ADI tentatively established by WHO is 0.005 mg/kg.

76-2928. Yamada, T. (Natl. Inst. Agric. Sci., Minist. Agric. For., Tokyo, Japan). [**Dynamics of diphenyl ether derived herbicides in soil.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 312-317; 1976. (48 references) (Japanese)

The degradation, the metabolism by animals, plants, and microorganisms, and the experimental degradation in laboratory soil of diphenyl ether based herbicides with nitro and chlorine substitution were described. Representative compounds are nitrofen, clomethoxynil, bifenox, fluorodifen, chloroxuron, 4-nitrophenyl 2,4,6-trichlorophenyl ether, and 3-methylphenyl 4-nitrophenyl ether, all of which are widely applied to flooded paddy fields. Commonly the nitro group is first reduced to an amino group. In actual farm fields the formation and persistence of amino compounds were confirmed by a nationwide survey. The amino residue was unexpectedly high. It was also found that the translocation of 4-nitro- or 4-aminophenyl 2,4,6-trichlorophenyl ether into rice plant and rice grains from soil was very small. Generally, the water solubility of these diphenyl ether derivatives was low enough not to cause problems for fish and earthworms. The higher reactivity of 4-aminophenyl-substituted phenyl ethers should be further studied from the viewpoint of their reaction products in relation to residues, physiological activity, and toxicity. It was also stated that the study of the seemingly stable mixed aminophenyl phenyl ethers in soil is necessary.

76-2929. Murai, T. (Natl. Inst. Agric. Sci., Min. Agric. For., Tokyo, Japan). [**Photodegradation of pesticides.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 319-324; 1976. (28 references) (Japanese)

Common problems, procedures, and representative instances of photodegradation of pesticides were described. Although UV is mainly utilized in studying photodegradation it is necessary to consider whether the natural light contains a UV component and whether there are any photosensitizing agents in the natural environment along with the pesticide. After describing the common techniques used in studying photodegradation of pes-

ticides in the laboratory, instances of such phenomena in the case of actually used pesticides were given for parathion, disulfoton, diazinon, polychlorocyclodienes, dichlorophenoxyacetic acid, PCP, and nitrofen. In view of the possible increases in toxicity of products of photodegradation (including oxidation, isomerization, hydrolysis, and chain cleavage), the necessity of further studying such photodegradation was stressed.

76-2930. Kameda, S.; Hashimoto, Y. (Dep. Soil Pestic., Bureau Preserv. Water Qual., Tokyo, Japan). [**Environmental pollution by pesticides and countermeasures for the future.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 336-337; 1976. (Japanese)

Because of the strict control of application of pesticides in agriculture since about 1971, the release of pesticides into the environment was reduced. The results of recent surveys suggest that environmental pollution by pesticides and their residues is decreasing. For example, the results of the Agency's survey on water, bottom mud, and fish in representative rivers showed no *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD (TDE), or *o,p'*-DDT in the water. However, *p,p'*-DDT, *p,p'*-DDE, and *p,p'*-DDD were detected in 40% of bottom mud samples at average levels of 0.0014, 0.0011, and 0.002 *m*g/g repectively. In addition *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD, and *o,p'*-DDT were detected in 14, 88, 51, and 12% of fish respectively, amounting to maxima of 0.0013, 0.015, and 0.002 *m*g/g, respectively. No aldrin, endrin, dieldrin, nor telodrin (isobenzan) was detected. Figures for BHC were also presented. In crop fields, the greatest problem has been residues of aldrin and dieldrin; however, crops containing these residues have scarcely been found of late. Organochlorine pesticide residues in wild birds were still high, and those in mothers' milk showed a slight decrease in 1975 compared to the values in 1971-1972. The amended pesticide regulation act would improve the situation somewhat if properly applied for examining carcinogenicity, teratogenicity, and mutagenicity in mammals, effects on birds and fish, biological concentration, dynamics in the environment and living organisms, persistency in the environment, and combined toxicity due to multiple applications of pesticides.

76-2931. Burns, R. G. (Biol. Lab., Univ. Kent, Canterbury, Kent, England). **Factors affecting pesticide loss from soil.** *IN: Soil Biochemistry* Vol. 4, Ed by E.A. Paul and A.D. McLaren, Marcel Dekker Inc., 1975, p. 103-141. (245 references)

The factors affecting pesticide loss from soil are reviewed. Once in the soil, pesticides may be destroyed, inactivated, or removed in five basic ways: microbial decay, nonbiological decomposition, volatilization, water movement, and plant uptake. Most pesticides are subject to elimination by a combination of these mechanisms. The factors affecting pesticide loss from the soil are divided into five categories: type of soil, including its makeup, structure, and prior treatment; type of chemical, including physical properties, solubility, vapor pressure, and stability; climatic conditions such as rainfall, pressure, temperature, and sunlight; the type, nutrient requirements, adaptations, and life cycles of the biological population; and the method of pesticide application (such as granular, wettable powder, or solvent). These factors are discussed in detail based on literature references.

76-2932. Pretanik, J. S.; Childs, E. A.; Wilmes, C. J. (Dep. Food Technol. Sci., Knoxville, TN). **Survey of Tennessee-processed vegetables for possible presence of pesticides.** *Tenn. Farm Home Sci. Prog. Rep.* 93 : 27; 1975. (8 references)

Pesticide content was determined in vegetables processed in Tennessee during 1974. Vegetable samples were taken from processing plants. Analysis was performed using thin-layer chromatography on alumina-coated plastic plates, developed with 0.5% acetone in pentane. Pesticides monitored included aldrin, chlordane, DDE, DDT, diazinon, dieldrin, endrin, ethion, heptachlor, lindane, methoxychlor, methyl parathion, parathion, phorate, TDE, and toxaphene. No detectable amount of any of these chemicals was present. Since these samples had already been processed, it is possible that pesticide residues had already been either washed away or destroyed during blanching and thermal processing steps. Thus fresh vegetables might have had measurable residues.

76-2933. Bird, C. W.; Khan, R. (Dep. Chem., Queen Elizabeth Coll., Campden Hill, London, England). **The addition of *p*-chlorobenzenethiol to isodrin.** *Tetrahedron Lett.* (32): 2813-2814; 1976. (6 references)

The room temperature addition of *p*-chlorobenzenethiol to isodrin in cyclohexane solution with free access of oxygen was studied. The sulfide fraction was oxidized to a mixture of the corresponding sulfoxides by iodobenzene dichloride in pyridine, and subsequent thin-layer chromatographic (tlc) separation gave two isomeric sulfoxides. These two sulfoxides, one of which contained the dichloroethylene grouping, were also present as such in the reaction mixture. The major reaction product was a ketone which on oxidation gave the corresponding sulfoxide. The identity of the hydroperoxide responsible for oxidation of the sulfides to sulfoxides is not known. Oxidation of isodrin also occurred during the reaction, yielding a half-cage ketone (presumably via rearrangement of endrin). The findings have implications for the environmental degradation of isodrin.

76-2934. Ruzo, L. O.; Holmstead, R. L.; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720). **Solution photochemistry of the potent pyrethroid insecticide α-cyano-3-phenoxybenzyl *cis*-2,2-dimethyl-3- (2,2-dibromovinyl) cyclopropane-carboxylate.** *Tetrahedron Lett.* (35): 3045-3048; 1976. (13 references)

Photolysis of (S)-α-cyano-3- phenoxybenzyl *cis* (1R,3R)-2,2-dimethyl-3- (2,2-dibromovinyl) cyclopropanecarboxylate (I) in methanol, hexane, or 40% water-acetonitrile was carried out. The products were isolated, identified, and quantitated by thin-layer and gas chromatography, infrared and mass spectrometry, and nuclear magnetic resonance. In hexane, I underwent isomerization, decarboxylation, and debromination. Major products from the acid moiety in methanol and hexane were dibromovinyl and monobromovinyl acids and, in methanol, their methyl esters. Photolysis in aqueous acetonitrile yielded only the dibromovinyl acid from the acid moiety. Vinylic free radicals were probable intermediates in the photoreductions. On photolysis in methanol or hexane, the alcohol moiety yielded the nitrile, dimers, the cyanohydrin, and the aldehyde. The major product of I in hexane, absent in methanol, was the benzoyl cyanide, while the major product in methanol was the methyl benzoate. The only major products from the alcohol moiety in aqueous acetonitrile were the aldehyde and 3-phenoxybenzoic acid. Products not retaining the original ester linkage can be explained by homolytic cleavage of the carboxyl-carbon or acyl-oxygen bonds. The photochemical pathways of I must include at least partial intersystem crossing to the triplet and reaction from that excited state.

76-2935. Belonosov, V. M. (Author address not given). **Soderzhanie geksakhlortsiklogeksana v shersti ovets posle obrabotki v geksakhloran-kreolinovykh emul'siiakh. (Soobshchenie 2). [(Contents of hexachlorocyclohexane in sheep wool following treatment in hexachlorane-creolin emulsions. II).]** *Tr. Vses. Nauch.-Issled. Inst. Vet. Sanit.* 39: 168-172; 1971. (2 references) (Russian)

The total BHC and lindane contents of the wool were investigated by gas-liquid chromatography in sheep after dipping in different hexachlorane-creolin emulsions. After dipping in a 1% emulsion of technical-grade hexachlorane (BHC) containing 12-16% lindane, corresponding to a lindane concentration of 0.026-0.016% in the emulsion, the total BHC contents in the wool ranged from 1,240 to 10,120 mg/kg, of which 7.8-25.9% was accounted for by lindane. After bathing in a 1% emulsion of 3% activated creolin containing 0.028-0.023% lindane, the total BHC content of the wool was 672-3,980 mg/kg, and lindane accounted for 21.2-38.3% of the total BHC. After bathing in a 0.5% emulsion of 6% creolin, the total BHC content of the wool was 360-1,712 mg/kg, and lindane accounted for 64.6-91.1% of the BHC. The findings indicate that the percentage of lindane in the wool increases with the improvement of the quality of the preparations, while the overall BHC level decreases.

76-2936. Johansson, C. E. (Food Lab., Natl. Food Admin., S-104 01 Stockholm, Sweden). **Bromidhalter i saltade jordnotter, tomater och gurkor. [Bromide levels in salted peanuts, tomatoes, and cucumbers.]** *Var Foeda* 27(3): 146-149; 1975. (6 references)

The phenol red method was used to determine bromide levels in salted peanuts, tomatoes and cucumbers. In 39 samples of peanuts tested, the bromide concentration ranged from 6 to over 70 mg/kg, with 13 samples containing over 50 mg/kg of bromide. In 25 samples of tomatoes the bromide concentration ranged from less than 5 to 40 mg/kg, with 7 samples containing more than 20 mg/kg of bromide. All 25 samples of cucumbers had bromide concentrations ranging between 0 and 10 mg/kg, with 22 samples below the 5 mg/kg mark. Although the tomato samples came from Holland, Romania, Spain, and Switzerland, the 7 samples with concentrations over 20 mg/kg all originated in Holland.

76-2937. Struif, B.; Weil, L.; Quentin, K.-E. (Inst. Wasserchem. Chem. Balneol., Tech. Univ. Muenchen, Munich, Germany). **Verhalten von herbiziden Phenoxyessigsaeuren und ihre Ester im Gewaesser. [Herbizidal phenoxyacetic acids and their esters in water.]** *Vom Wasser* 46: 53-73; 1976. (29 references) (German)

The water solubility of phenoxyacetic ester herbicides is discussed. In comparison with the free acid, phenoxyacetic esters have reduced water solubility. This decrease is determined by the number of C-atoms in the alcohol group of the ester. Under natural pH, temperature, and buffer conditions, phenoxyacetic esters hydrolyze. The hydrolysis of esters catalyzed by acid is less effective than hydrolysis catalyzed by hydroxyl ions. There is clear indication that *pK*a, basicity of the leaving group, and steric hindrance in the alkaline region do influence hydrolysis. At a pH of 7.0 and at 20°C, the half lives for hydrolysis are between 5 and 30 days. At 4°C the half-life values for hydrolysis increase 6-fold. Adsorption of 2,4-D and 2,4,5-T to flocculated humic acids is small. The corresponding esters adsorb more strongly with increasing numbers of C-atoms in the alcohol chain. A linear inverse relation exists between water solubility and adsorption equilibrium constants. Adsorption on humic acids accelerated the rate of hydrolysis of phenoxyacetic esters. The whole process is called remobilization by hydrolysis.

76-2938. Kubota, S.; Ariizumj, H.; Yamamoto, S. (Yamanashi Prefect. Inst. Public Health, Kofu, Yamanashi, Japan). **[A study on the persistence of a new molluscicide, 2,5-dichloro-4-bromophenol (B-2).]** *Yamanashi Kenritsu Eisei Kogai Kenkyusho Nempo (Annu Rep. Yamanashi Prefect. Inst. Public Health)* 19: 54-57; 1975. (6 references) (Japanese)

The fate in water and the persistence in soil and crops of a new molluscicide, 2,5-dichloro -4-bromophenol(B-2), active against *Katayama nosphola*, a vector of *Schistosoma japonica*, were studied. The persistence recorded in flooded paddy fields was relatively low: six days were required to drop from 25 to 0.003 ppm, mainly due to dilution. The persistence in paddy field soil had been reported to differ widely due to varying condi-

tions; however, the half life found in actual fields amounted to about 2 weeks after the fourth application at 25 g (10% granules)/m². The residual amount on rice straw after four applications at 25 g (10% granules)/m² was 0.84 ppm, and that in brown rice grain was less than 0.05 ppm. These results would indicate a good degree of safety, especially the safety of rice from containing the actual residues. However, additional studies are necessary on the residues when the molluscicide is applied in different stages of rice culture.

76-2939. Lingens, F. (Inst. Mikrobiol., Univ. Hohenheim, D-7000 Stuttgart 70, Germany). **Umweltchemikalien und ihr mikrobieller Abbau. [Environmental chemicals and their microbial breakdown.]** *Zentralbl. Bakteriol., Parasitenkd., Infektionskr. Hyg., Abt. I Orig. Reihe B* 162(1-2): 114-126; 1976. (30 references) (German)

The degradation of aromatic and chlorosubstituted compounds is examined, along with the microbial breakdown of herbicides, fungicides, antibiotics, and alkaloids. Compounds synthesized by man which have in turn entered our environment are called environmental chemicals. Some of these chemicals are easy to break down, and others are difficult, depending on their chemical constitution. Although physical and chemical processes do play a part in this breakdown, microbial processes are primarily responsible. Various microorganisms may be involved simultaneously in the breakdown of a compound. The mechanism involved depends on the microorganisms. Certain compounds are broken down via various intermediates. It is possible that several pathways of degradation may exist simultaneously for a single microorganism. Extrachromosomal elements may be involved in this process.

76-2940. Knackmuss, H.-J.; Beckmann, W.; Dorn, E.; Reineke, W. (Inst. Mikrobiol., D-3400 Goettingen-Weende, Germany). **Zum Mechanismus der biologischen Persistenz von halogenierten und sulfonierten aromatischen Kohlenwasserstoffen. [The mechanism of biological persistence of halogenated and sulfonated aromatic hydrocarbons.]** *Zbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. I Orig. Reihe B* 162(1-2): 127-137; 1976. (11 references) (German)

Biological degradation of halogenated and sulfonated aromatic hydrocarbons is discussed. Halogenated or sulfonated aromatic compounds are mainly degraded by cometabolism. The negative inductive effect (—I-effect) of the halogen substituents impedes the electrophilic attack of oxygenases, particularly of the pyrocatechases. The enzyme affinity for the substrate increases with the number of halogen substituents, but the rate of ring cleavage decreases according to the presence of halogen substituents. In certain positions of substitution the —I-effect can be weakened by the ±M-effect of the halogen, as demonstrated by benzoate oxygenation. When aromaticity is lost through the action of dioxygenases, the halide can be eliminated with increased ease, and total mineralization becomes possible. Naphthalene-2-sulfonic acid was degraded by a naphthalene-utilizing *Pseudomonas* strain. The sulfonic acid group appeared to be eliminated oxygenolytically, and the carbon skeleton was channeled into the naphthalene pathway.

76-2941. Heeschen, W.; Bluethgen, A.; Tolle, A. (Inst. Hyg., Bundesanst. Milchforsch., D-2300 Kiel, Germany). **Rueckstaende chlorierter Kohlenwasserstoffe in Milch und Milch-produkten—Situation und Bewertung. [Residues of chlorinated hydrocarbons in milk and milk products-situation and evaluation.]** *Zbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. I Orig. B* 162(1-2): 188-197; 1976. (12 references) (German)

A study was made of the residues of chlorinated hydrocarbons in milk and milk products obtained from 20 supply areas in the German Federal Republic. In 1974 the mean values found (fat basis) were: α-BHC, 0.04; γ-BHC, 0.072; heptachlor epoxide, 0.024; dieldrin, 0.021; and DDT, 0.20 ppm. These values were far below the maximum tolerance limits and did not constitute any toxicologic risk. Concentrations of hexachlorobenzene in some cases reached the permissible maximum quantity of 0.5 ppm on a fat basis. Not only does hexachlorobenzene find its way into milk through its application as a fungicide, but also via several other, in part unknown, sources in or on vegetable products. PCB concentrations ranged from 0.2 to 3.0 ppm.

76-2942. Wagner, R.; Hoyer, J. (Arbeitshyg. Untersuchungsst., GDR-1211 Manschnow, DDR). **Arbeitsplatzkonzentration von PSM waehrend der Ausbringung im Freiland und unter Glas und Folie sowie in Getreidespeichern. [Workplace concentrations of pesticides during spraying in the open air, in glass and plastic greenhouses, and in granaries.]** *Z. Gesamte Hyg. Ihre Grenzgeb.* 22(8): 583-585; 1976. (14 references) (German)

Occupational hazards resulting from plant protection chemicals (pesticides) were evaluated. The study was concerned with the following chemicals: methyl parathion, DDVP (dichlorvos), dimethoate, tinox (demephion), phosdrin, DDT, lindane, dicofol, azoxybenzene, DNOC, and trichlorfon. The study conditions involved spraying the chemicals in the open air, under glass and film (greenhouses), and in granaries. Values exceeded the maximum permissible levels while spraying with dichlorvos and phosdrin and in the course of hot atomization in the greenhouses. Values measured while spraying granaries with Fekama, which is composed of 22% DDT and 4% lindane, were in the vicinity of the maximum permissible values. In the open-air tests, values exceeding maximum permissible levels occurred only when Wofatox (methyl parathion) was sprayed.

76-2943. Wilson, R. G., Jr.; Cheng, H. H. (Univ. Nebraska Panhandle Stn., Scottsbluff, NB 69361). **Breakdown and movement of 2,4-D in the soil under field conditions.** *Weed Sci.* 24(5): 461-466; 1976. (11 references)

The fate of 2,4-D [(2,4-dichlorophenoxy) acetic acid] in the soil under winter wheat (*Triticum aestivum* L. 'Nugaines') and fallow cropping schemes was studied under the field conditions of eastern Washington in 1973 and 1974 using formulated dimethylamine salt and isooctyl ester of 2,4-D. Soil samples taken 1 hour after herbicide application showed that amine-treated plots retained considerably more applied 2,4-D than ester-treated plots. The rapidity of 2,4-D breakdown decreased gradually with time, and at the end of 6 months, an average of 0.04 ppm of 2,4-D remained in the sampled soil profile regardless of formulation, application rate, or cropping scheme. Loss of 2,4-D from the soil surface in runoff occurred when the plots were irrigated heavily one day after the herbicide application. The herbicide was also leached into the soil profile by both irrigation and natural precipitation. Herbicide concentrations in the sampled portion of the upper soil profile decreased during the summer and then increased slightly in the fall. (Author abstract by permission)

76-2944. Ladlie, J. S.; Meggitt, W. F.; Penner, D. (Plant Sci. Rep., Elanco, PO Box 3008, Omaha, NB 68103). **Effect of soil pH on microbial degradation, adsorption, and mobility of metribuzin.** *Weed Sci.* 24(5): 477-481; 1976. (22 references)

Metribuzin [4-amino- 6-tert-butyl- 3-(methylthio-as-trazin-5(4H)one] degradation by soil microorganisms decreased as the soil pH decreased. Metribuzin and atrazine [2-chloro- 4-(ethylamino)- 6-(isopropylamino)-*s*-triazine] mobility increased with increasing concentration and soil pH. ^{14}C-Metribuzin had greater mobility on soil thin-layer plates than ^{14}C-atrazine because of differences in water solubility and basicity. Adsorption increased with decreasing soil pH. The *pK*a for metribuzin was 0.99 ± 0.08. Adsorption increased gradually as the soil pH decreased toward the *pK*a of metribuzin. Protonation of the amine group with subsequent adsorption to soil colloids was the postulated reason for the reduction in phytotoxicity, microbial degradation, and mobility of metribuzin at low soil pH levels. (Author abstract by permission)

76-2945. Ladlie, J. S.; Meggitt, W. F.; Penner, D. (Plant Sci. Rep., Elanco, PO Box 3008, Omaha, NB 68103). **Role of pH on metribuzin dissipation in field soils.** *Weed Sci.* 24(5): 508-511; 1976. (15 references)

Metribuzin [-4-amino- 6-*tert*-butyl- 3-(methylthio)-*as*-triazine- 5(4H)one] residues analysis of soil samples showed greater amounts of residue extractable at soil pH 6.7 than 4.6. Metribuzin leaching increased with increasing soil pH. Metribuzin disappearance from soil followed pseudo first-order kinetics. The half-life of metribuzin decreased as soil pH increased and increased at all soil pH levels as depth of sampling increased. The decreased activity and decreased rate of metribuzin dissipation at lower soil pH is apparently due to protonation and increased adsorption. (Author abstract by permission)

76-2946. Savage, K. E. (South. Weed Sci. Lab., Agric. Res. Serv., U. S. Dep. Agric., Stoneville, MS 38776). **Adsorption and mobility of metribuzin in soil.** *Weed Sci.* 24(5): 525-528; 1976. (11 references)

The sorption equilibria and relative mobility of metribuzin [4-amino- 6-*tert*-butyl- 3-(methylthio)- *as*-triazin- 5(4H)-one] were evaluated on 16 soils from the lower alluvial flood plain of the Mississippi River as a function of soil properties. Metribuzin sorption and mobility were significantly correlated with each other and both parameters were significantly associated with clay content, organic matter, and water content at 0, 0.33 field capacity (FC), and 15 bars tension. Prediction equations for adsorption (K_1 = -1.10 0.08 FC) and mobility (Rf = 0.81 - 0.015 FC) indices were developed based on water content at 0.33 bar tension (FC). A competitive effect was observed between the combination of various levels of clay and organic matter as related to metribuzin adsorption. (Author abstract by permission)

See also 76-2881 76-2882 76-2956 76-3004 76-3026 76-3079

76-2947. Quer Brossa, S. (Author address not given). **Clinica y tratamiento de los principales sindromes toxicos ocasionados por pesticidas.** [**Diagnosis and treatment of the main toxic syndromes caused by pesticides.**] *Afinidad* 33(333): 63-64; 1976. (Spanish)

Acute or chronic intoxication by pesticides is most often due to occupational or accidental exposure. Absorption of chemicals, resulting in local or systemic effects, may take place through the skin or through the respiratory and digestive tracts. In case of poisoning by metal derivatives, therapy consists of an intravenous dose of EDTA (1 g) for lead or an injection of BAL (3 mg/kg) for arsenic or mercury. Chlorine derivatives, if ingested, cause acute illness with vomiting and diarrhea. After a period of latency, nervous disorders may appear with agitation, headache, paralysis of the tongue, leg and arm pains, convulsions, and even coma. These substances are only slowly excreted and are stored in adipose tissue. Slight but prolonged exposure produces chronic intoxication, with weakness, loss of appetite, liver damage, and mental disorders. Treatment is merely symptomatic and is aimed at combating neuritis and protecting the liver. The absorption of organic phosphorous compounds results in the inhibition of cholinesterase, impairing the functioning of the nervous system. In serious cases, two sets of toxic symptoms appear, one muscarinic (nausea, sweating, etc.) and respiratory, similar to asthma. This may be followed by a nicotinic syndrome, reminiscent of nicotine poisoning, with tremors, knee pains, and convulsions. Subacute intoxication occurring after exposure to small quantities of these chemicals over short periods results from a progressive blockage of cholinesterase. Treatment consists of atropine sulfate (2 mg) administered intravenously every 15-20 min. until the drug takes effect. Cholinesterase is reactivated through a dose of 0.50 g PAM (pralidoxine). Newer products, such as Toxogonin (obidoxime), of similar chemical composition, may also be used at 0.25 g intravenously, 2-3 times in 24 hours. At the appropriate time, symptomatic treatment begins.

76-2948. Dennis, Jr., W. H.; Cooper, W. J. (US Army Med. Bioeng. Res. Develop. Lab., Fort Detrick, Frederick, MD 21701). **Catalytic dechlorination of organochlorine compounds. I. DDT** *Bull. Environ. Contam. Toxicol.* 14(6): 738-744; 1975. (9 references)

Chemical dechlorination of organochlorine pesticides is considered as a possible method for their disposal. Up to 62% of the organically bound chlorine is rapidly lost from DDT in methanol by the catalytic action of nickel boride, Ni_2B, with an excess of sodium borohydride, $NaBH_4$. Experimentation showed that DDT was best dechlorinated in methanol at a 1:15:0.5 molar ratio of DDT: $NaBH_4$Ni(II). Further addition of sodium borohydride did not significantly increase the extent of dechlorination. The rate of loss of organically-bound chlorine from DDT is rapid. It was concluded that the $Ni_2B/NaBH_4$ system in methanol offers a simple and rapid method to partly dechlorinate DDT. However, the value of this reaction as a disposal method would depend on the assessment of the biodegradability and toxicity of the reaction products and its applicability to DDT formulations.

76-2949. Sidorenko, G. I.; Perelygin, V. M. (A. N. Sysin Inst. Gen. Munic. Hyg., Moscow, USSR). **Problematika hygienickych norem chemickykh latek v pude.** [**The problem of hygienic standards for chemical substances in the soil.**] *Cesk. Hyg.* 20(3): 103-107; 1975. (14 references) (Czech)

The problem of establishing standards for levels of chemicals in the soil is an important one, since those substances can have either direct (via skin contact or inhalation) or indirect (via eventual contamination of air, water, and crops) effects on human health. Initial attempts at standardization in the USSR were conducted in 1953-1965, and various criteria were used: effect of the chemicals on soil microbiological activity, chemical levels in food crops and subsurface waters, and toxic effects of chemicals on experimental animals. Unfortunately, it was not until the early 1970s that the problem of setting maximum permissible concentrations for chemicals in the soil began to receive more serious and widespread attention. The major efforts in this area should clearly be focused on those chemicals which are extensively used, are highly stable in the soil, and for which maximum permissible concentrations in air, water, and plants have been established. This would include primarily pesticides, heavy metal salts (Pb, As, Hg), and trace elements used as fertilizers (Mb, Cu, Zn, B, V). Carcinogens in the soil have also been the object of some recent studies. Problems of differences among soil types, climates, and plant species characteristics must also be considered in standardization efforts, so that representative materials and conditions may be selected for study.

76-2950. Heyndrickx, A.; Van Peteghem, C.; Van den Heede, M.; Lauwaert, R. (Dept. Toxicol., State Univ. Ghent, Ghent, Belgium). **A double fatality with children due to fumigated wheat.** *Eur. J. Toxicol.* 9(2): 113-118; 1976. (11 references)

Two siblings, aged 2 and 4 yr, died within 18 hr after playing for 1 hr on wheat treated with malathion, pyrethrum, and phosphine. The results of external and postmortem internal examinations suggested that death was due to an acute intoxication, and a toxicological analysis was performed. The cholinesterase activities in the viscera were not lowered, and alcohol was found in the blood, liver, and small intestine. These results suggested malathion ingestion with subsequent hydrolysis of the pesticide in the body, yielding two molecules of ethanol. It was assumed that phosphine had been ingested as well and that this compound was the cause of death. This conclusion is based on the facts that phosphine is much more toxic than malathion, and that it was continuously generated from not completely dissolved aluminum phosphide tablets in the wheat while the children were still playing.

76-2951. Nagai, R. (Sch. Dermatol., Fac. Med., Yokohama Munic. Univ., Yokohama, Kanagawa, Japan). [**Occupational and allergic dermatitis in Japan.**] *Hifuka No Rinsho (Clin. Dermatol.)* 18(9): 601-610, 1976. (61 references) (Japanese)

A slight increase in officially reported cases of occupational dermatoses was observed from 1965 to 1972. The cases of occupational skin injury were due to 2-methyl-4 chlorophenoxyacetic *o*-chloroanilide (MCPC, 13 cases), hydrazine sulfate (10 cases), PCP (4 cases), BHC, and parathion, one case each in 1965), and one case each due to fenitrothion mixture and organosulfur fungicide in 1974. A relatively detailed explanation of dermatitis due to pesticides was given, which indicates that there are more cases of primary irritation and intoxication than cases of allergic nature. Dermatitis due to captafol was diagnosed as primary irritation and allergic reactions, including photosensitization. Some cases of dermatitis due to PCP were diagnosed as allergic. According to detailed studies, dermatitis due to Omite acaricide, 2-(*p-tert*-butylphenoxy) cyclohexyl propyl sulfite, begins with primary irritation and develops to allergic dermatitis secondarily. From these descriptions and the results of patch tests on 155 farmers it was concluded that pesticides are import causes of allergic dermatitis.

76-2952. Mikuni, I.; Suzuki, A. (Sch. Ophthalmol. Fac. Med., Tokai Univ., Hatano, Kanagawa, Japan). [**A case report of ocular erosion by paraquat dichloride.**] *Kanagawa Igakukai Zasshi (J. Kanagawa Med. Assoc.)* 3(2): 76; 1976. (Japanese)

A case of lingering keratoconjunctivitis was reported. The occurrence was caused by the sprayer nozzle falling off from the hose during application of a 100 fold diluted aqueous solution of 25% paraquat dichloride. Although the eye lesion took 5 weeks to heal, the patient's visual acuity was restored completely. The treatments consisted of internal and topical (eye-wash) application of steroid, and eye washing with an antibiotic beginning immediately after the accident.

76-2953. Taneda, M.; Murasaki, M. (Sch. Psychoneurol., Fac. Med., Kitasato Univ., Sagamihara, Kanagawa, Japan). [**Organophosphorus toxicosis: a cause of somnolentia.**] *Kanagawa Igakukai Zasshi (J. Kanagawa Med. Assoc.)* 3(2): 124; 1976. (Japanese)

Over a period of 3 years, symtpoms of depression and of somnolentia were recorded from 46 cases of organophosphorus toxicosis confirmed by the presence of more than 0.01 ppm of organophosphorus compound in the blood. Ocular symptoms were present in 64% of these patients: neurosis, in 41% autonomic neurosis in almost 100% depression in 33%, and somnolentia in 60%. There were 28 cases of somnolentia including 4 paroxysmal, 14 periodic, 7 continuous, and 3 unclassificable cases. The average age of these patients was 34.2 yr, and the ratio of men to women was 13:15. Ritalin was effective in 9 of 11 cases. The most frequent cause was dichlorvos (25 cases). According to polygraph studies, 4 cases of sleep onset REM specific for narcolepsy and 4 cases of quasi-narcolepsy were discovered. These findings indicated a change from continuous through periodic to paroxysmal type symptoms, paralleling the clinical symptom changes after treatment.

76-2954. Lubyanskii, M. L.; Trefilov, V. N. (Author address not given). **Gigienicheskaya otsenka metoda ognevogo obezvrezhivaniya stochnykh vod proizvodstv fosfororganicheskikh yadokhimikatov.** [**Hygienic assessment of flame neutralization of wastewater from organophosphate pesticide production plants.**] *Khim. Prom-st. (Moscow)* 5: 343-345; 1976. (9 references) (Russian)

Hygienic assessment is presented of shaft and cyclone type incinerators used for the detoxification of wastewaters from organophosphorus pesticide (demeton, methyl parathion, DEF, and malathion) production plants. The shaft furnace, processing 0.5-4m³ of wastewater with 0.2-6.42 mg/liter pesticide concentration, proved to be suitable for complete detoxification of the organophosphates only when the temperature of the top zone was at least 1,000°C at wastewater COD levels of less than 80 g/liter and at a capacity of 2m³/hr. Up to 6 kg of phosphorus pentoxide were emitted hourly. No traces of organophosphorus compounds were found in the flue gases of the cyclone furnace operating at 950-1,050°C, regardless of load and organophosphate concentration in the water. Organophosphorus compound concentrations of 0.02-0.81 mg/m³ were measured at distances of up to 250 m around the incinerators. The concentrations of inorganic phosphorus compounds were 0.02-0.18 mg/m³.

76-2955. Lesch, P.; Blume, U.; Scheibe, G.; Sussmann, P.; Schmidt, F. W.; Bartels, M.; Okonek, S. (Abt. Gastroenterol. Haematol., Dep. Inn. Med., Med. Hochschule, Hanover, Germany), **Haemoperfusion durch verkapselte Aktivkohle zur Therapie exogener und endogener Intoxikationen.** [Hemoperfusion by means of encapsuled charcoal for the treatment of exogenous and endogenous intoxications.] *Klin. Wochenschr.* 54(11): 509-516; 1976. (35 references) (German)

In vitro studies of the method developed by Chang using charcoal encapsulated in collodion and albumin as artificial cells for hemoperfusion were made. The absorption capacities for barbiturate, diazepam, and parathion (more or less readily dialyzable exogenous substances) and *p*-hydroxyphenyl acetate (an endogenous toxic metabolite) were studied. In about 90 min 80-90% of the initial concentration of barbiturate, diazepam, and *p*-hydroxyphenyl acetate can be eliminated and about 50% of the initial concentration of parathion. Bromide and ammonia are not absorbed. Unsuccessful attempts were made to avoid the need for regional heparinization by incorporating heparin into the capsules of charcoal granules. If the hemoperfusion system is correctly prepared and sterile precautions are observed along with regional heparinization, the use of this detoxication shunt holds promise in the treatment of severe exogenous and

endogenous intoxications which cannot be treated by conventional means.

76-2956. Sugahara, N.; Oki, S. (Sch. Legal Med., Fac. Med., Yamaguchi Univ., Yamaguchi, Japan). [**A case of suicide by fenitrothion and the cholinesterase levles in the blood of the corpse.**] *Nippon Hoigaku Zasshi (Jpn. J. Legal Med.)* 30(1): 46; 1976. (Japanese)

A 47-year-old man committed suicide, presumably by taking fenitrothion after a drinking bout. He was found in convulsions, vomiting foam. Small samples of a yellowish brown, viscous liquid were extracted from stomach contents, blood, and urine. Thin layer chromatograms (developed with *n*-hexane:acetone 4:1 v/v, color reagent palladium chloride) of the extracts showed 3 spots (stomach contents and blood) and 2 spots (urine), respectively. The chromatograms obtained from stomach contents and blood coincided well with those of authentic fenitrothion. By determining 3-methyl-4- nitrophenol in the degradation products of the sample, the fenitrothion contents of stomach contents, blood, and urine were assessed at respectively 14.08 mg/300 ml, 54.15 μg 50 ml and 27.08 μg/30 ml. Blood taken from the corpse showed a serum cholinesterase activity of 0.13 and an erythrocyte cholinesterase activity of 0.39. The degrees of inhibition were 75-83% and 81-87%, respectively, compared to those of normal persons.

76-2957. Arimatsu, Y.; Matsushita, T.; Nomura, S. (Sch. Dermatol., Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Epidemiologic study of skin hazards due to dithiocarbamate fungicides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 28-33; 1976. (17 references) (English)

Skin hazards due to dithiocarbamate fungicides were studied. An epidemiologic survey reported 197 cases of contact dermatitis due to dithiocarbamates. The highest incidence rate was observed in farmers who had been engaged in spraying (40%), picking (25%), and weeding (18%) of their crops. Lesions were generally located on the face, hands, and nape of the neck and collar areas. Covered areas of the body were also affected. One case, occurring in a 40-yr-old male farmer, is detailed. Treatment consisted of Flucort cream applied topically to the lesions, 20 ml Minofagen C injected iv, and Cellestamin given po. On the 7th day the lesions were almost completely improved. Patch tests indicated that an allergic type of contact dermatitis was prevalent in those cases.

76-2958. Mikami, H.; Ishimaru, O.; Ogawa, T.; Sasaki, K.; Sato, O. (Abashiri Kosei Hosp., Hokkaido, Japan). [**Results of health examinations before and after pesticide application on farmers in the Kitayama area.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 70-71; 1976. (Japanese)

Skin allergy symptoms frequently occur in farmers of Kitayama near Abashiri city, especially after drinking alcoholic beverages. The present health survey was carried out to determine whether this fact could be attributed to pesticide application. The individuals studied were 77 male farmers engaged in pesticide application, and the method of survey used cards recorded by the farmers themselves and collected in May and September. No findings were obtained indicating that the symptoms were caused by pesticide. It was noticed that less than 5% of the farmers wore protective goggles, respirators, and waterproof clothing.

76-2959. Nagata, H.; Izumiyama, T.; Kamata, K.; Takano, S.; Saito, M.; Suzuki, K.; Tajiri, H.; Kobayashi, S.; Kurotani, S. (Hokushin Gen. Hosp., Nagano, Japan). [**Results of multiphase health examinations of pesticide applicators in grape and apple orchards with combined pesticides. 1.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 196-197; 1976. (Japanese)

Results of health examinations performed in June, July, and October, 1975 on 60 farmers, including pesticide applicators in a village engaged in grape and apple growing, were described. On the average, the number of days spent in pesticide application were 17.5, 14.2, and 23.8, respectively, by farm men, farm women, and male speed sprayer applicators. Usage frequencies were 44, 51, and 5%, respectively, for insecticides, fungicides, and other substances. The average morbidity was 13.2% (men), 25.2% (male speed sprayer applicators), and 20% (women). Major symptoms were apparent sensory impairment of cranial nerves, dermatitis, and ocular disturbances. The use of protective clothing and apparatus was very infrequent. Liver function was poorer in men than in women, and anemia was more frequent in women. Although the frequency of abnormal EEGs was higher than that in healthy persons, no difference was found in the results before and after pesticide application. No correlation was seen between EEG findings, blood chemistry, and subjective symptoms.

76-2960. Ishige, T.; Uchida, A. (Inst. Rural Med., Fac. Med., Chiba Univ., Chiba, Japan). **Results of health examinations of pear farmers in Chiba prefecture, with particular reference to EEG findings in (pesticide) speed sprayer operators.** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 198-199; 1976. (Japanese)

Health examinations were performed on pear farmers in Chiba prefecture in 1975. Complaints of fatigue, stiff shoulders, and lumbago were more frequent in women than in men. Hypertension was recorded in 15.4% of the men and 22.2% of the women. Abnormal electrocardiograms were found in 35.9% of the men and 16.7% of the women. Anemia was noted in 5.1% of the men and 16.7% of the women. Abnormal liver function was detected infrequently, as were glycosuria and proteinuria. EEG studies were performed on seven speed sprayer operators employed in this capacity for 3-4 years, and working in this capacity for 15-25 days in 1975. The average number of

hours worked per day was 9, and the principal pesticides applied were fenitrothion, estox, diazinon, imidan, dichlorvos, benomyl, thiophanate-methyl, zineb, dicofol, and machine oil. Four borderline abnormal cases were noted, and two abnormal EEGs, including one severe case. The results of a second EEG study on the same operators in 1976 and on eight new operators showed a slight aggravation of findings in experienced operators and slight abnormalities in the new operators (2 borderline cases and one abnormal).

76-2961. Sugafuji, H.; Yamaki, S.; Takizawa, H.; Umezu, T.; Nawa, S.; Ito, A.; Furukawa, F.; Nishiyama, H.; Sugano, H. (Kita-Fukushima Farmers' Coop., Fukushima, Japan). [**Results of health examination on pesticide applicators in North Fukushima farmers' cooperative.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 200-201; 1976. (Japanese)

Health examinations were performed on 144 speed sprayer operators. Parameters examined included history taking, gross examination, hematological and hemobiochemical examinations, RBC, WBC, hemoglobin, ChE activity, ZTT, urinalysis, and blood pressure. The subjects were mainly in their Thirties and forties, with an occupational history of 10-15 years as speed sprayer operators. Major subjective symptoms were indicative of surgical, abdominal, and systemic disorders. Only 16% of the patients had no subjective symptoms. Based on the results of these examinations, the authors could not find any clear-cut cases of intoxication due to pesticides.

76-2962. Kudo, Y.; Yokoi, T.; Nakamura, I.; Norie, Y.; Nishida, N.; Kagami, M. (Sch. Hyg., St. Marianna Med. Coll., Kawasaki, Kanagawa, Japan). [**Cellular change of erythrocyte system in peripheral blood due to pesticides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 2020-2030; 1976. (Japanese)

Erythrocyte abnormalities were detected in peripheral blood of farmers who applied relatively large amounts of organochlorine and organomercury pesticides. Similar phenomena were also found in experimental animals administered organochlorine pesticides. Results obtained by microscopic study of fluorescent stained specimens are reported. The occurrence of punctate basophilia (more than 0.05%) was seen in 122/390 inhabitants of a village where large amounts of organochlorine and organomercury pesticides were applied in 1966-1967. Many cases of dermatitis were seen. This finding was recorded in only 20/120 inhabitants in a village where antibiotic pesticides, *N*-methylcarbamates, organosulfates, organophosphates, and some herbicides were applied (determinations made later than 1973, after the ban on organochlorine and organomercury pesticides). No dermatitis was seen in this village. After daily intramuscular injection of several kinds of pesticides into rabbits, the frequency of occurrence of basophilic stippled erythrocytes and reticulocytes in peripheral blood increased significantly. The pesticides were thiophanate-methyl, chlorobenzilate, and 2,4,6-trichlorophenyl-4'-nitrophenyl ether.

76-2963. Fujita, K.; Fujita, H. (Saku Gen. Hosp., Usuda, Nagano, Japan). [**A finding on human population cytogenetics.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 204-205; 1976. (Japanese)

The results of cytogenetic studies on peripheral blood samples taken from 393 inhabitants in a village of Nagano Prefecture are discussed. Out of 3754 cells examined in mitosis, the frequency of significant chromosomal breakage including isolocus breaks, fragments, bridges, and deletions in farmers was 0.03658 (30-40 year old group), 0.03738 (40-50 year old group), 0.02093 (50-60 year old group), 0.00980 (60-70 year old group) and 0 (age over 79), and in non-farmers it was 0.03836 (teenagers), 0.02800 (20-30 year old group) and 0.01425, 0.02013, 0.02644, 0.01786 and 0.02966, respectively, in the thirty, forty, fifty, sixty, and over 70 year old groups. These figures reflected a greater frequency of chromosome breakage in farmers in their thirties and forties. The phenomenon might have been caused by pesticide exposure.

76-2964. Sugaya, H.; Wakatsuki, S. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan). [**Results of nationwide survey of pesticide intoxication cases, 1975.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 328-329; 1975. (Japanese)

Cases of pesticide intoxication including acute systemic poisoning, acute impairments of skin, eyes, and nasopharynx, pesticide allergy, accidental and suicidal intoxication, and suspicious chronic diseases, were surveyed nationally in Japan from Jan. 1 to Dec. 31, 1975. There were 175 reports (96 men and 79 women) from 29 medical organizations, with an average of 6.1 cases per organization. The origins of intoxication were as follows: during application (61.7%), not during application (20.6%), accidental (3 cases), and suicidal (16.0%). The pesticides which caused intoxication were mainly organophosphorus pesticides (34.3%; 60 cases); 18 cases were caused by fenitrothion, 16 cases by nicotine sulfate, 13 cases by captafol, 7 cases by paraquat, and a few cases each by EPN, salithion, benthiocarb, and chlorpyrifos. There were 93 (53.1%) acute systemic poisoning cases and 63 cases (36.0%) of skin impairment. There were some cases of combined intoxication.

76-2965. Taya, T.; Sugiura, K.; Fukuda, M.; Ishihara, K.; Niwa, T. (Dep. Intern. Med. Pediatr., Tsuchiura Kyodo Hosp., Tsuchiura, Ibaraki, Japan). [**Intoxication of an entire family by fenitrothion.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 330-331; 1976. (Japanese)

A case of intoxication of an entire family due to

household application of a 1:10 dilution of 10% fenitrothion EC was reported. After application of about 1.21 EC (calculated) in two rooms (total 10m²), the husband, (age 41), his wife (age 38), their daughter (age 5), and their two sons (ages 10 and 8) slept for the night. Next morning, the wife and daughter showed symptoms of disorientation and nausea, and vomited. After 3 days they exhibited diarrhea and abdominal pain, and the daughter died on the sixth day with a diagnosis of acute heart failure and general debility. The younger boy was hospitalized with miosis, loss of light reflex, impaired vision, cloudy consciousness, and reduced serum ChE activity. His symptoms disappeared after 10 days of hospitalization. The symptoms of the elder boy were similar to those of the younger, with the addition of bloody sputum and abnormal EEG. His symptoms also disappeared after 10 days of hospitalization. The wife's symptoms were more severe than those of her sons, with headache, reduction of mental concentration, and long-term reduction of ChE. The husband's symptoms were the slightest; however, ChE activity was restored after a month. The antidotes used in this case were pralidoxime, atropine, and glutathione.

76-2966. Kobayashi, M.; Yoshida, H.; Saito, H.; Saito, K.; Ogiwara, T.; Kamitono, T.; Hayashi, M.; Tachikawa, H.; Chiba, F.; Sugaya, H. (Hiraga Gen. Hosp., Hiraga, Akita, Japan). [**Clinical and pathological examination of organophosphorus pesticide intoxication.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 332-333; 1976. (Japanese)

Clinical progress and the results of serum enzyme examinations and EEG findings were reported in 4 cases of suicide due to ingestion of large doses of organophosphorus pesticides. Also discussed were findings in the central nervous system, especially the cerebellum, and in liver and kidney. The first case involved the swallowing of 120 ml dichlorvos, followed by death after 18 hr of hospitalization. The second victim took 50 ml malathion and later recovered. The third case involved an unknown amount of disulfoton and resulted in death of the victim. The last involved 10 ml soilcin, but recovery was effected. The first and second cases were treated by injection of 2-PAM (pralidoxime) and atropine sulfate, with peritoneal dialysis in the first case. The amounts of 2-PAM and atropine sulfate were 39.0 g and 36.5 mg, respectively, in the first case and 50.0 g and 82.5 mg, respectively, in the second case. In the first case, diffuse and continuous impairment of cerebral cortex and subcortical regions was caused by dichlorvos.

76-2967. Chikamori, M.; Hirano, M.; Tanaka, T.; Suga, M. (Dep. Dialysis, Chikamori Hosp., Kochi, Japan). [**Pesticide intoxication.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 334-335; 1976. (Japanese)

The treatment of 13 patients (6 in 1974, 4 in 1975, and 2 in 1976) who attempted suicide by ingestion of pesticides was described. Of the six 1974 cases involving organophosphorus pesticides, four were saved by hemodialysis. The severest case, in which a large amount of estox was swallowed, showed cyanosis with hypertension. Death occurred during hemodialysis. The two 1975 cases involving organophosphorus pesticides (diazinon plus dichlorvos and dichlorvos) were saved by hemodialysis. Treatment was accomplished by tracheotomy, fluid replacement, and antibiotics. A case of EPN poisoning in 1976 was controlled with 2-PAM (pralidoxime). Of the two cases where 20% paraquat dichloride resulted in death, one treated with peritoneal dialysis showed signs of remission at one time. The autopsy findings indicated: (1) macroscopically—high atelectasis, specific fibrosis, and conspicuous passive in the lungs, cloudy swelling of the kidneys and liver, hypertrophy of the left heart, and erosion of the stomach; and (2) microscopically—atelectasis, alveolar septal inflammation, congestion, hypertropy of alveolar epithelium and bronchial epithelium of the left lung, increase of the congestive component in the glomerula of the kidney, and dilation and necrosis of proximal kidney tubules.

76-2968. Hanada, K.; Kameda, T.; Hayashi, S.; Sugaya, H.; Suzuki, Y.; Odana, B. (Inst. Rural Med., Hiraga Gen. Hosp., Hiraga, Akita, Japan). [**Research and survey on the patch test for dermatitis due to pesticides Part 4. Comparison of response between farmers and non-farmers.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 338-339; 1976. (Japanese)

A patch test placed on the skin of the back in 36 farm women (pesticide applicators) and 40 non-farm women (hospital staff and students) was carried out using the following pesticides at normal application concentrations and 10 times and 100 times the normal concentration: fenitrothion, diazinon, chlorobenzilate, tetrachloroisophthalonitrile (chlorothalonil), zineb, paraquat dichloride, nitrofen, captafol, benthiocarb, thiophanate, and blasticidin S. The test was carried out in March-April, 1976, and the evaluation of the effect was carried out 48 hr after the patch was applied. No difference in the frequency of positivity was seen between farm women and non-farming women. The frequency of positivity was highest for tetrachloroisophthalonitrile, followed by captafol, then by blasticidin S in both groups. The numbers of persons who had used pesticides and showed positive responsess and negative response were 11 and 112, respectively, while there were 65 people who had no history of using pesticides and showed a positive response.

76-2969. Horiuchi, N.; Kambe, Y.; Kato, E.; Ando, S. (Saku Gen. Hosp., Usuda, Nagano, Japan). [**Studies on the criteria of diagnosis in dermatitis due to pesticides. Part 3. Results of patch tests on pesticide-dermatitis patients engaged in lettuce cultivation and irradiation.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 340-341; 1976. (Japanese)

Results of patch tests on 51 lettuce-cultivating far-

mers with 12 pesticides which have been recognized to easily cause dermatitis at normal application concentrations were 40 positives (including 17 men) out of the total group of members, 33 positives out of 38 persons with a history of pesticide dermatitis, and 7 positives out of 13 persons without the dermatitic history. Dicofol and tetrachlorisophthalonitrile (chlorothalonil) showed positivity frequencies of 31 and 47% in aqueous solution, showing a primary irritant reaction. Patch tests were performed with pesticides used in the past year on 25 persons who visited the hospital in 1975 with dermatitis caused by unknown pesticides. The percentage of positivity was 80%, and positivity was often found for the same pesticide which caused dermatitis. Pesticides which gave positive results were tetrachloroisophthalonitrile, DES zineb, dicofol, ovex, DMC, etc. Positive reactions to more than one pesticide were seen in 14 cases (55%), indicating the necessity of studying cross sensitization. A special patch test was employed on 19 patients with pesticide dermatitis, which consisted of determining the minimum UV irradiation level causing erythema (MED). Application of a pesticide patch for 24 hr and UV irradiation at 0.5 MED indicated photosensitzation by paraquat dichloride, trifluralin, and tetrachloroisophthalonitrile.

76-2970. Arimatsu, T.; Misumi, J.; Ueda, A.; Matsushita, T.; Nomura, S. (Sch. Pub. Health, Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Skin injuries among fungicide applicators in citrus orchards.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 342-343; 1976. (Japanese)

Frequent occurrence of skin injuries among fungicide applicators in citrus orchards in villages of Kumamoto Prefecture has been reported. These reports were investigated in a health examination. According to inquiries the morbidity rate for the skin injuries in two representative villages was 71.3% and 56.3%, higher in women than in men. The injury generally developed after one week of contact with fungicide, while harvesting (60%), or while applying pesticides. The major pesticides used were thiophanate-methyl and benomyl, and the specific injury was exanthema on the back, abdomen, and femoral skin. Results of pesticide patch tests on 137 and 134 farmers of the two villages showed higher positiviity for benomyl (concentrations of 0.05 and 0.5%). These facts indicate the participation of an allergic mechanism in the occurrence of skin impairment. It was recommended that the application of thiophanate-methyl or benomyl should be carried out as the last plant protection treatment and that workers should use protective cream.

$76-2971. Pinedo Saiz, L. (Inspect. Provinc. San. Vet. Zaragosa, Zaragoza, Spain). **El sector agropecuario y los infortunios profesional es, zoonosis y riesgo de la clase veterinaria.** [**Animal husbandry and occupational accidents, zoonoses, and veterinary risks.**] *Rev. San. Hig. Pub.* 49(3): 247-283; 1975. (Spanish)

Citing many legal and historical references, this report seeks to define the concept of occupational disability on behalf of Spanish agricultural and livestock workers. The author describes the problems of the rural environment, the economic repercussions of work-related accidents and illnesses, and the inadequacy of present Social Security legislation in Spain. Zoonoses, i.e., the diseases of animals communicable to man, with their specific characteristics and means of prevention, are the object of a lengthy analysis as a major professional risk. Pesticides (fungicides, rodenticides, insecticides, and anti-parasitics) receive brief mention as one of the hazards of veterinary practice.

76-2972. Quinones, M. A.; Bogden, J. D.; Louria, D. B.; Nakah, A. E.; Hansen, C. (Dep. Prevent. Med. Community Health, Coll. Med. Dent. New Jersey, New Jersey Med. Sch., Newark, NJ 07103). Depressed cholinesterase activity among farm workers in New Jersey. *Sci. Total Environ.* 6(2): 155-159; 1976. (14 references)

The widespread use of organophosphate pesticides creates the possibility of excessive exposure of migrant farm workers to these compounds. Fifty-seven Southern New Jersey migrant farm workers of Puerto Rican ancestry were screened for organophosphate pesticides exposure based on blood cholinesterase determinations. Thirty-five controls of similar ancestry but not employed in agricultural occupations were also tested. Frequently reported symptoms of the farm workers which might be related to pesticide exposure (headaches, dizziness, weight loss, nausea, general weakness, loss of energy) were also studied. The cholinesterase activities of the farm workers were significantly depressed, with 10.5% of this group having values below the lower limit of normal. There was no significant relationship between the symptoms reported and the depressed enzyme levels.

76-2973. Ueda, K. (Inst. Odontol. Res., Showa Univ., Tokyo, Japan). [**Side effects of pharmaceuticals. Toxic substances in the environment; pesticides and other agricultural chemicals.**] *Sogo Rinsho (Clinic All-Round)* 25(9): 2012-2015; 1976. (12 references) (Japanese)

Within the past five years, the number of pesticide intoxications has decreased as follows: 1035 (752), 1026 (605), 1961 (572), 810 (449), and 641 (407), respectively, in 1970, 1971, 1972, 1973 and 1974, including the dead in parentheses. In 1974, there were 112 cases (1 fatal) while applying pesticides; there were 7 cases (all fatal); suicides accounted for 160 cases, and homicides for 58. For treating intoxication due to newer organophosphorus pesticides, atropine is mainly effective, then 2-PAM (pralidoxime); simultaneous administration of glutathione is recommended in case of methyl group containing organophoshorus pesticides. Atropine is also recommended in cases of intoxication due to carbamates but 2-PAM is not. The large number of intoxications during application of methomyl was pointed out. Because of remaining

supplies of the rodenticide, sodium monofluoroacetate, intoxication due to its misuse might be possible. Also, the frequent occurrence of intoxication due to paraquat dichloride, leading to lung fibrosis, was pointed out and the treatment was explained in detail. The theory of Ishikawa concerning the etiology of children's impaired vision in Nagano Prefecture, assuming that the cause is chronic intoxication by organophosphorus pesticides, is deemed unsatisfactory in accordance with an epidemiologic survey including patients from other regions.

76-2974. Satomura, K.; Okumura, H. (First Sch. Intern. Med., Nihon Med. Coll., Tokyo, Japan). [**First aid plan for emergency cases of acute chemical intoxication.**] *Sogo Rinsho (Clin. All-Round)* 25(Suppl.): 1142-1145; 1976. (9 references) (Japanese)

In cases of acute chemicals intoxication certain checkpoints, items of examination, and the first aid treatments should be noted. The checkpoints are recording of the case history including ingestion of chemical (chemical composition, formulation, amount, and time after ingestion). Stomach contents, urine, and feces should be kept for identification of chemicals contained in them. The items to be examined are: heart rate, blood pressure, body temperature, hematologic parameters, urinalysis, electrocardiogram, and neurological examination. Treatment should be given to prevent absorption of chemicals, accelerate the excretion of already absorbed chemical, provide specific treatment against specific symptoms, and allow administration of specific antidotes such as pyridine-2-aldoxime methiodide (pralidoxime) for organophosphorus pesticides.

76-2975. Luzhnikov, E. A.; Aleksandrovskii, V. N.; Tsunikov, A. I.; Kosarev, B. A.; Pavlov, A. S. (Author address not given). **Nevrologicheskie i elektrofiziologicheskie izmeneniya posle ostrogo peroral'nogo otraveleniya fosfororganicheskimi insektitsidami.** [**Neurological and electrophysiological effects after acute peroral organophosphate insecticide poisoning.**] *Voenno-Med. Zh.* (11): 41-44; 1975. (Russian)

Results of neurologic, electroencephalographic, and electromyographic examinations performed on 17 women and 24 men 18-50 yr of age, who had sustained acute oral poisoning with trichlorfon, parathion, or malathion 2-3 years earlier are presented. A variety of symptoms such as mild asthenic symptoms, tremor of the gastrocnemius muscle, recurrent vertigo, impaired memory, hypersensitivity of the distal parts of the limbs, tremor of the eyelids and fingers, increased tendon reflex, reduced muscular tonus, and labile pulse were observed in 13 of the subjects. The brain electric activity was normal in 8 of these subjects; slight disturbances of the alpha-activity were observed in three. Subjects of this group had exhibited mild muscarinic effects during the acute poisoning. Marked asthenic symptoms, irritability, sleep disorders, tremor of the gastrocemius muscle, tremor of the fingers and eyelids, increased tendon reflex, horizontal nystagmus, and reduced muscular tonus were observed in another group of 28 subjects, whose EEG showed reduced background activity and considerable disorganization and deformation of the basic rhythms. Pronounced muscarinic and nicotinic effects had been observed in these patients during the acute poisoning.

76-2976. Bezuglyy, V. P.; Kaskevich, L. M.; Komarova, L. I. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polymers and Plastic Materials, Kiev, USSR). **Tsirroz pecheni kak sledstvie dlitel'nogo vozdeystviya pestitsidov.** [**Cirrhosis of the liver due to chronic pesticide exposure.**] *Vrach. Delo* (3): 142-145; 1976. (Russian)

Observations of three patients with liver cirrhosis as a sequel of chronic toxic hepatitis due to prolonged occupational exposure to pesticides are reported. None of the patients drank alcohol immoderately and all had had hepatic symptoms for several years before consulting the physician. One patient, aged 52, developed chronic toxic hepatitis with recent transition into liver cirrhosis in the course of exposure to DDT, hexachlorane (BHC), trichlorfon, trichlorometaphos (ronnel), zinc phosphide, zoocoumarin (warfarin), and ratindan (diphacinone) as a pest control worker for 24 years. Another 46-year-old chemical worker developed liver cirrhosis as a consequence of slowly progressive toxic hepatitis after nine years of intense contact with organophosphorus pesticides, continued for 11 years. Toxic hepatitis developing into liver cirrhosis was diagnosed in a 35-year-old male who had been exposed to TMTD (thiram) at a seed dressing plant for 12 years.

See also **76-2881** **76-2888** **76-2908** **76-2924** **76-3028** **76-3034** **76-3080**

76-2977. Lehotzky, K.; Ungvary, G. (State Inst. Occup. Health, H-1450 POB 22, Budapest, Hungary). **Experimental data on the neurotoxicity of fenitrothion.** *Acta Pharmacol. Toxicol.* 39(3): 374-382; 1976. (16 references)

The neurotoxic effect of fenitrothion was studied in rats and rabbits. Fenitrothion (10 and 100 mg/kg) caused alteration in the conditioned avoidance reflex of rats. The number of conditioned responses diminished as the latency period lengthened, and the tendency to extinction was slower. The whole blood cholinesterase activity showed marked inhibition during the toxic effects. In rabbits (10 and 25 mg/kg fenitrothion per day) the conduction velocity of the sciatic nerve became slower. Rabbits poisoned with the higher dose showed marked signs of intoxication while others showed no signs at all. Histological findings showed destruction of the myelinated fibers of the sciatic nerve. These results suggest that fenitrothion has a neurotoxic effect. The type and mechanism of action is not known. Comparison studies with other organophosphates suggest that the mechanism of action of fenitrothion is similar to that of these other compounds.

76-2978. Paulov, S. (Fac. Agric., Komenski, Univ. Bratislava, Czechoslovakia). **The effects of the herbicides Burex, Zeazin-50, and Aminex on the development of amphibia.** *Agrochemia (Prague)* 16(4): 102-103; 1976. (8 references)

The effects of three herbicides on the development of toad tadpoles (*Bufo bufo*) were studied. The herbicides used were Burex (pyrazon), Zeazin-50 (atrazine), and Aminex. The inhibiting effect of the herbicides on the development of amphibia depended on the chemical structure of the herbicide and on the concentration of the biologically active substance in the water. Burex showed the highest biological activity for tadpoles. Zeazin-50 was less active. No influence on the development of amphibia was noted with Aminex at the same concentration of active substance in water (8 mg/kg). The levels of contamination which were tested should not be reached under good agricultural practices and conditions.

76-2979. Tesic, D.; Terzic, L. J.; Dimitrijevic, B.; Zivanov, D.; Slavic, M. (Inst. Pharmacol. Toxicol., Fac. Vet. Med., Belgrade, Yugoslavia). **Experimental investigation of the effect of environmental temperature and some medicaments on the toxic effect of dinitroorthocresol.** *Acta Vet. (Belgrade)* 22(2): 45-52; 1972. (15 references)

Mice were intoxicated with Creosan paste, containing 50% of the sodium salt of dinitroorthocresol (DNOC), by a single s.c. injection. Vitamin E (30-50 mg/kg), vitamin A (2,500-5,000 i.u.), chlorpromazine (1-12 mg/kg), Tyrode solution (1 ml), 5% glucose in Tyrode solution (2.5 g/kg), or thiamazole (50 mg/kg) was administered s.c. or i.p. 30 min before DNOC treatment. The lethal time of DNOC was decreased as the environmental temperature was increased, and the DNOC-induced inhibition of oxygen consumption by the liver tissue of intoxicated animals was reduced on exposure to low temperatures. Survival time was prolonged by vitamins A and E and glucose in Tyrode solution. Tyrode solution alone had no effect, whereas vitamin E and glucose exerted a protective effect after a single injection. Vitamin A alone and thiamazole exerted a protective effect only after repeated administration, and chlorprozazine in small doses intensified the toxicity of DNOC in some animals, but exerted a protective effect at higher doses.

76-2980. Francis, A. J.; Spanggord, R. J.; Ouchi, G. I.; Bramhall, R.; Bohonos, N. (Stanford Res. Inst., Menlo Park, CA 94025). **Metabolism of DDT analogues by a *Pseudomonas* sp.** *Appl. Environ. Microbiol.* 32(2): 213-216; 1976. (7 references)

Several chlorinated and nonchlorinated analogues of DDT were investigated to determine their extent of biodegradation by a *Pseudomonas* sp. and to gain further understanding of microbial decomposition of DDT. The biodegradation usually involved fission of an aromatic nucleus. Neither alkyl carbons in the diphenylmethane or diphenylethane derivatives were attacked initially. Nonchlorinated compounds 1,1-diphenylethane and diphenylmethane were rapidly metabolized with formation of 2-phenylpropionic acid and phenylacetic acid, respectively. 2,2-Diphenylethanol was not metabolized. *p*-Chlorophenyl compounds were metabolized rapidly as sole carbon sources, including 1-(*p*-chlorophenyl)-1-phenylethane, 1-(*p*-chlorophenyl)- 1-phenylethanol, and 1-(*p*-chlorophenyl)-1- phenylethane. Unsubstituted aromatic rings were cleaved first. None of the *p,p'*-dichlorosubstituted ring compounds were metabolized as sole carbon sources. Therefore both aryl-chlorine substitution and α-carbon substitution are significant in determining biodegradability by this bacterium.

76-2981. Rump, S.; Faff, J.; Szymanska, T.; Bak, W.; Borkowska, G. (Dep. Toxicol., Milit. Inst. Hyg. Epidemiol., Warsaw, Poland). **Efficacy of repeated pharmacotherapy in experimental acute poisonings with fluostigmine.** *Arch. Toxicol.* 35(4): 275-280; 1976. (8 references)

The effectiveness of repeated pharmacotherapy in acute poisonings with fluostigmine (DFP) was studied in rats. It was demonstrated that the second i.p. administration of obidoxime (40 mg/kg) was without effect. Repeated i.p. administration of atropine (10 mg/kg) showed marked efficacy only in animals treated previously with atropine (10 mg/kg) and diazepam (2.5 mg/kg). This procedure was without effect in animals treated just after intoxication with atropine (10 mg/kg) or atropine (10 mg/kg) and obidoxime (40 mg/kg). Subsequent administration of diazepam (2.5 mg/kg) or caramiphen (10 mg/kg) was without effect. (Author abstract by permission)

76-2982. Blair, D.; Dix, K. M.; Hung, P. F.; Thorpe, E.; Stevenson, D. E.*; Walker, A. I. T. (Shell Res. Ltd.,

Tunstall Lab., Sittingbourne, Kent, England). **Dichlorvos—a 2-year inhalation carcinogenesis study.** *Arch. Toxicol.* 35(4): 281-294; 1976. (25 references)

To determine the effects of dichlorvos vapor on the tumor incidence in rats, 5 week old Carworth Farm E strain rats weighing between 94 and 150 g were exposed to 0, 0.05, 0.5, and 5.0 mg/m^3 in a 2-year inhalation study. The growth rate of all treated rats was depressed, particularly in the males. There was increased survival of the rats exposed to 5 mg/m^3. There were no consistent differences in food intakes, organ weights, or hematological or blood chemistry estimations, except for cholinesterase activities, amongst the various groups of rats. No compound-related differences were seen in acetylcholine and choline estimations carried out on a small number of female rats' brain tissues after two years' exposure. There were no gross or microscopical compound-related changes in the rats' tissues. Ultrastructural examination of the respiratory tissues of the rats from the control and 5 mg/m^3 group showed no changes attributable to dichlorvos. The results of a relative risk analysis of the tumor data showed that no dose-related increase in tumur risk was established for rats of either sex. The data confirms the results of earlier studies supporting the safety of insecticidal uses of dichlorovs. (Author abstract by permission)

76-2983. Spalding, J. W.; Ford, E.; Lane, D. (Environ. Toxicol. Branch, Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Effect of 4-chlorobiphenyl on substrate transport and phospholipid metabolism in mouse L5178Y lymphoma cells.** *Biochem. Pharmacol.* 25(18): 2051-2058; 1976. (23 references)

The toxicity of 4-chlorobiphenyl, a constituent of Aroclor 1221, was studied in mouse L5178Y cells, in vitro. 4-Chlorobiphenyl had a varied effect on the uptake of small precursor molecules. Uptake of [^{3}H]L-leucine, [^{3}H]L-serine, [^{3}H]uridine, and [^{3}H]thymidine was inhibited, while that of [^{3}H]inositol was stimulated. There was no significant effect on either [^{14}C]ethanolamine or [^{14}C]choline uptake. However, 4-chlorobiphenyl significantly inhibited the incorporation of [^{14}C]choline into phosphatidylcholine. This effect on phosphatidylcholine metabolism depended on the adsorption and continued presence of 4-chlorobiphenyl on the cell plasma membrane. The stimulation of [^{14}C]choline incorporation was reversed when treated cells were placed in fresh growth medium under conditions where 95 per cent of the 4-chlorobiphenyl was desorbed from the cell surface. The effect of 4-chlorobiphenyl on substrate uptake and phospholipid metabolism appears to depend upon the interaction of the agent with the cell membrane surface. (Author abstract by permission)

76-2984. Pohl, L. R.; Nelson, S. D.; Porter, W. R.; Trager, W. F.; Fasco, M. J.; Baker, F. D.; Fenton, J. W., II.* (New York State Dep. Health, Albany, NY 12201). **Warfarin—stereochemical aspects of its metabolism by rat liver microsomes.** *Biochem. Pharmacol.* 25(19): 2153-2162; 1976. (56 references)

The *R*- and *S*-enantiomers of warfarin were differentially metabolized by hepatic microsomes prepared from male Wistar and Sprague-Dawley rats. These studies were not only carried out with two strains of rats but were conducted independently in two laboratories employing different techniques. Although minor differences were observed, the same stereoselectivity was found for the microsomal transformations produced by both strains. The formation of 7- and 8-hydroxywarfarin was stereoselective for the *R*-enantiomer and in addition this enantiomer was metabolized more rapidly than the *S*-enantiomer. The converse stereoselectivity was found for the process of 4′-hydroxylation in Sprague-Dawley rats but it could not be conclusively shown for Wistar rats. A Michaelis—Menten analysis of the metabolic products of *R*- and *S*-warfarin formed by liver microsomes from male Sprague-Dawley rats is reported. The *K*m for the processes of 6-, 7-, and 4′-hydroxylation for both isomers and the *K*m for 8-hydroxylation of the *R*-isomer were all on the order of 0.03 to 0.11 m*M* and were not statistically different. The *K*m for 8-hydroxylation of the *S*-isomer, 0.20 m*M*, was significantly greater. The *K*m for benzylic hydroxylation of both isomers appeared to be still greater but was less precisely determined. The *V*max for each of the enantiomeric pairs of products was statistically different. The kinetic data are interpreted as being inconsistent with the supposition that an arene oxide (6-7 and/or 7-8) may serve as the intermediate in the formation of 7-hydroxywarfarin from either isomer. Further, if product formation is assumed to be rate limiting, the data provides evidence for at least three distinct enzymatic processes which may or may not be distinct hemoproteins. Reduction of the side-chain ketonic function of warfarin to the corresponding diastereomeric warfarin alcohols by the 105,000 *g* supernatant fraction displayed both a high degree of stereoselectivity (*R*-isomer) and stereospecificity (*S*-reduction). This reduction was best catalyzed by NADPH rather thab by NADH. Determination and quantification of the metabolic products obtained after incubation of *R*- and *S*-warfarin with the 10,000 *g* supernatant were consistent with the summation of those independently produced by the microsomal pellet and the 105,000 *g* supernatant. (Author abstract by permission)

76-2985. Adelman, I. R.; Smith, L. L., Jr.; Siesennop, G. D. (Dep. Entomol. Fish. Wild., Univ. Minnesota, St. Paul, MN 55108). **Chronic toxicity of guthion to the fathead minnow (*Pimephales promelas* Rafinesque).** *Bull. Environ. Contam. Toxicol.* 15(6): 726-733; 1976. (10 references)

Fathead minnows (*Pimpephales promelas* Rafinesque) were exposed to various concentrations of Guthion (azinphosmethyl) over a complete life cycle, from egg through fry in the second generation, to determine a maximum acceptable toxicant concentration (MATC). The lowest concentration of Guthion that had an adverse effect was 0.51 μg/liter, where fecundity was significantly

reduced. An estimation of the MATC based on this parameter would be 0.33 and 0.51 μg/liter Guthion. Effects on survival and growth during early life stages occurred at slightly higher concentrations; based on these parameters, an MATC of 0.51 and 1.8 μg/liter Guthion is suggested. An application factor based on previous acute toxic concentration data and the MATC from this study would be between 0.00017 and 0.00027.

76-2986. Hulth, L.; Larsson, M.; Carlsson, R.; Kihlstrom, J. E. (Inst. Zoophysiol., S-751 22 Uppsala, Sweden). **Convulsive action of small single oral doses of the insecticide lindane.** *Bull. Environ. Contam. Toxicol.* 16(2): 133-137; 1976. (5 references)

The convulsive action of small single oral doses of lindane was studied in mice. Adult female albino mice received lindane (10 mg/kg p.o.) with pentylenetetrazol injected at 1, 2, 3, 6, 12, and 24 hr after lindane. In another experiment mice received lindane (10, 7.5, 5, 2.5, and 1.2 mg/kg, p.o.) with pentylenetetrazol injected 3 hr later. The first experiment showed that the sensitivity to pentylenetetrazol increased rapidly with a peak after 3 hr when 80% of the lindane treated animals showed convulsions compared to 13% in the control group. The sensitivity to pentylenetetrazol was not observed at 12 hr after lindane administration. The results of the second experiment showed that all the tested lindane doses elicited a significantly higher frequency of convulsions than would be expected from pentylenetetrazol exposure without prior exposure to lindane. Thus the consulsive dose threshold for pentylenetetrazol is lowered by small single oral doses of lindane in the mouse.

76-2987. Charnetski, W. A. (Agric. Canada Res. Stn., Lethbridge, Alberta, Canada). **Organochlorine insecticide residues in ducklings and their dilution by growth.** *Bull. Environ. Contam. Toxicol.* 16(2): 138-144; 1976. (13 references)

The levels of dieldrin, DDT, DDE, and DDD (TDE) in ducklings were studied and efforts were made to determine if the dieldrin used between 1960 and 1964 contributed to the residue load. Ducklings were collected from ponds in a 15-km radius of Strathmore, Alberta, Canada. The surrounding land is scrub pasture land with the arable area devoted to mixed farming, including some irrigation. The levels of DDTT (DDE, DDD, and DDT combined) in the 45 ducklings ranged from 0 to 2.62 ppm and from 0 to 0.11 ppm in 43% and 19% of the birds, respectively. The most probable source of contamination of the ducklings was the parent duck, with the insecticide transferred through the egg. No dieldrin or DDT residues were found in ducklings' food sources. There was no record of DDT use in this area. The use of dieldrin in this habitat is not considered a contributing factor, as the insecticide concentrations decreased with duckling weight. Growth dilution was considered the most significant factor in reducing the insecticide residue levels in the ducklings.

76-2988. Davison, K. L.; Cox, J. H. (USDA, ARS, Metab. Radiat. Res. Lab., Fargo, ND 58102). **Methoxychlor effects on hepatic storage of vitamin A in rats.** *Bull. Environ. Contam. Toxicol.* 16(2): 145-148; 1976. (8 references)

The effects of methoxychlor on hepatic storage of vitamin A were studied in rats when methoxychlor was fed over a range of levels. Sprague-Dawley rats were fed diets containing technical methoxychlor at 0, 10, 100, 1,000, and 10,000 ppm for 16 weeks, with some receiving feed ad lib. and others on restricted-feeding regimens. At 10,000 ppm methoxychlor was lethal to some rats, caused a reduction in food consumption and growth, and produced an increase in liver weight relative to body weight. Methoxychlor at 1,000 ppm reduced food consumption and retarded growth in rats fed ad lib. but did not retard growth of restricted-feed rats. A reduction in the hepatic storage of vitamin A was noted when methoxychlor was fed at levels of 100 ppm or higher.

76-2989. Fabacher, D. L.; Chambers, H. (Dep. Entomol., Mississippi State Univ., Mississippi State, MS 39762). **Uptake and storage of ^{14}C-labeled endrin by the livers and brains of pesticide-susceptible and resistant mosquitofish.** *Bull. Environ. Contam. Toxicol.* 16(2): 203-207; 1976. (9 references)

The rate of uptake and storage patterns of endrin were measured in the livers and brains of pesticide-susceptible and resistant mosquitofish as possible mechanisms of endrin resistance. Ten each of susceptible and resistant fish died at the 20 ppb concentration. At 100 ppb all susceptible and resistant fish were killed within two hours. The brains and livers from susceptible fish killed with 20 ppb levels contained 1.9 times the amount of endrin found in resistant fish treated for the same time. Brain/liver ratios at 20 ppb were the same, indicating no difference in the distribution of endrin between the brains and livers of susceptible or resistant fish. At 1000 ppb, brains from susceptible fish contained more endrin than those from resistant fish, but the livers of resistant fish contained 2.2 times more endrin than those of suscpetible fish. At 1000 ppb all susceptible fish were killed by 45 min, resistant fish by 2 hr. The brain/liver ratio at 1000 ppb concentration was 5.8 times lower in resistant fish. It appears that at low concentrations, slower uptake of endrin in resistant fish may represent a major mechanism of resistance. At higher concentrations other mechanisms seem to be more important.

76-2990. Canton, J. H. (Natl. Inst. Public Health, Lab. Toxicol., Bilthoven, The Netherlands). **The toxicity of benomyl, thiophanate-methyl, and BCM to four freshwater organisms.** *Bull. Environ. Contam. Toxicol.* 16(2): 214-218; 1976. (9 references)

The EC50 or LC50 values after 2-day exposure for the fungicides benomyl, thiophanate-methyl, and BCM (carbendazim) have been determined for four freshwater

organisms: *Chlorella pyrenoidosa, Daphnia magna, Lebistes reticulatus,* and *Salmo gairdneri*. Thiophanate-methyl proved to be the least toxic for Chlorella and Daphnia, while benomyl was the most toxic for the two test fishes. The influence of BCM on the reproductive capacity of Daphnia allowed a provisional tolerance of less than 16 μg BCM/l to be established. In Chlorella the EC50 and LC50 values were 1.4 for benomyl, 8.5 for thiophanate-methyl, and and 0.34 for BCM. In Daphnia these values were 0.64, 16, and 0.46; in Lebistes 3.4, 130, and n.d.; and in Salmo 0.48, 7.8, and 1.8.

76-2991. Gupta, P. K.; Dhar, U.; Kapoor, V.; Bawa, S. R. (Dep. Biophys., Punjab Univ., Chandigarh, India). **Effect of cholinesterase inhibitor malathion on whole body irradiated rats.** *Bull. Environ. Contam. Toxicol.* 16(2): 219-224; 1976. (9 references)

The effect of malathion and radiation was studied separately and jointly on blood glucose, plasma electrolytes, and glycogen content of various tissues in 12-hr fasted female white rats. One groups served as controls, a second received a dose of 50 mg/kg malathion in propylene glycol i.p., the third group served as irradiation controls, while the fourth group received 50 mg/kg malathion half an hour after irradiation which consisted of exposure at the abdominal region to a single dose of gamma rays emitted from Co^{60} source at the rate of 37.1 R/min for 24.30 for a total dose of 900 Rads. Malathion had no effect on any of the three parameters. Radiation caused a significant increase in blood glucose for 12 to 24 hr after exposure, after which the values returned to normal. A fall in plasma sodium and rise in plasma potassium levels were apparent between 12 and 24 hr and 12 to 48 hr after irradiation, respectively. In pre-irradiated rats given malathion, no significant change in potassium levels was noted while the decrease in sodium levels was only of a minor degree and for a shorter period. Malathion produced no noticeable changes in glycogen content in any tissues. Radiation increased glycogen content of the liver, spleen, and brain between 12-48 hr. Administration of malathion to pre-irradiated rats added to the effects of radiation.

76-2992. Hoben, H. J.; Ching, S. A.; Young, R. A.; Casarett, L. J. (Dep. Pharmacol., Univ. Hawaii, Honolulu, HI 96816). **A study of the inhalation of pentachlorophenol by rats. V. A protein binding study of pentachlorophenol.** *Bull. Environ. Contam. Toxicol.* 16(2): 225-232; 1976. (8 references)

The properties of protein binding with PCP are defined and PCP binding of human plasma and albumin is compared with rat plasma and albumin. Varying the PCP concentration resulted in a linear relation to the amount of PCP bound per mg BSA. Increasing the protein concentration resulted in a decrease in the amount of PCP bound per mg protein. This suggests a rather non-specific binding being interfered with by protein-protein interaction. An inverse relation was noted between PCP binding and both pH and ionic strength. A decrease in temperature resulted in a decrease in available PCP. Examination of the albumin fractions offers no reason to suspect that protein binding would give rise to the differences in blood retention observed between exposed humans and rats. The amount of PCP/albumin is very nearly the same for the albumin of cow, man, and rats. However, this ratio is altered for human plasma suggesting that other factors in the plasma besides albumin are significant in the retention of this compound. Differences in binding between human plasma and rat plasma contribute to the longer retention and higher blood values observed in the human data as compared to the rat data.

76-2993. Reynolds, P. J.; Lindahl, I. L.; Cecil, H. C.; Bitman, J. (USDA, ARS, Nutrition Inst., Beltsville, MD 20705). **A comparison of DDT and methoxychlor accumulation and depletion in sheep.** *Bull. Environ. Contam. Toxicol.* 16(2): 240-247; 1976. (14 references)

A direct comparison was made of DDT and methoxychlor residues in sheep. Three groups of crossbred yearling ewes were fed a basal ration consisting of 30% cottonseed hulls, 67% ground barley, 0.6% urea, and the balance of minerals, vitamin A, and insecticide. Group 1 received technical DDT at 250 ppm of *p,p'*-DDT, while groups 2 and 3 received technical methoxychlor to supply 250 and 2500 ppm, respectively, of *p,p'*-methoxychlor. The rations were fed for 18 weeks, followed by a 16 week depletion period. Technical DDT yielded plateau levels at 8 weeks exposure of 524 ppm *p,p'*-DDT, 75 ppm *p,p'*-DDD (TDE), and 25 ppm *p,p'*-DDE in s.c. fat. Technical methoxychlor yielded no plateau, but rather a maximum value of 7.8 ppm of insecticide after 10 weeks exposure, followed by a linear decline of 0.6 ppm per week through the remainder of the accumulation period. At 2500 ppm of methoxychlor a plateau was reached in 6 weeks at 24.4 ppm. Therefore, residues of methoxychlor cannot be made to approach those of DDT, and, at similar levels of ingestion, may differ at a near plateau level by an order of 100:1.

76-2994. Engst, R.; Macholz, R. M.; Kujawa, M. (Acad. Sci. GDR, DDR-1505 Potsdam-Rehbruecke, DDR). **The metabolism of hexachlorobenzene (HCB) in rats.** *Bull. Environ. Contam. Toxicol.* 16(2): 248-252; 1976. (13 references)

The metabolism of HCB was studied in male Wistar rats which were exposed by gavage to 8 mg HCB/kg, dissolved in 1 ml sunflower oil, for 19 days. In organs examined, in particular the spleen, only PCB and PCP could be detected, and then in only small concentrations. HCB was determined in fat tissue at 82 ppm, muscle at 17 ppm, liver total 125 μg, kidney total 21 μg, spleen total 9 μg, heart total 1.5 μg, and adrenals total 0.5 μg each. The urine contained HCB and the main metabolite, PCP, alone with 2,3,4,6-tetrachlorophenol and/or 2,3,5,6-tetrachlorophenol, TCP, and PCB. Trace amounts of

2,3,4-TCP and other TCPs were detected. Small amounts of 2,4,6-TCP and 2,3,4,6-TeCP were present in the conjugated form as glucuronides. Feces contained high amounts of HCB and smaller amounts of PCB. A degradation scheme for HCB in the rat is presented.

76-2995. McBlain, W. A.; Lewin, V.; Wolfe, F. H. (Dep. Zool., Univ. Alberta, Edmonton, Alberta, Canada). **Differing estrogenic activities for the enantiomers of *o,p'*-DDT in immature female rats.** *Can. J. Physiol. Pharmacol.* 54(4): 629-632; 1976. (13 references)

Female rats (20-21 days) were given single intraperitoneal injections of (±)-*o,p'*-DDT, (-)-*o,p'*-DDT, or (+)-*o,p'*-DDT. At 18 hr their uteri were excised and the estrogen-sensitive parameters, uterine wet weight, and uterine glycogen content were measured. For *o,p'*-DDT, the levo enantiomer is the more active estrogen in immature female rats. Optical resolutions of other racemic environmental xenobiotics may be important in the evaluation of their biological effects.

76-2996. Benes, B.; Bencko, V. (Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Vylucovani troj- a petimocneho arzenu v moci mysi, exponovanych toxicke koncentraci trojmocneho arzenu v pitne vode. Studium tolerance arzenu. [The excretion of tri- and pentavalent arsenic in the urine of mice exposed to a toxic concentration of trivalent arsenic in potable water. The study of arsenic tolerance.]** *Cesk. Hyg.* 21(2): 56-59; 1976. (11 references) (Czech)

The excretion of tri- and pentavalent arsenic was studied in the urine of mice. Some mice were exposed to As(III) (250 mg/l) in potable water; control mice were not so exposed. After an exposure of 0, 2, 6, and 8 days to the potable water, dose of 1.3 mg As(III)/kg was given i.m. as ^{74}As(III) with an activity of 3/μCi/1ml. Urine was withdrawn after 1, 3, 5, 6, 12, and 24 hr. Mice in the control group (unexposed to arsenic in potable water) secreted half the injected amount in the form of As(V). In mice exposed to arsenic in potable water, four-fifths of the injected As(III) was excreted as As(V) even at 2 days after exposure. After 4 days of exposure more than 95% of the injected As(III) was excreted as As(V). After 8 days of exposure pentavalent arsenic alone was found in the urine of the mice.

76-2997. Ahmed, N. U. (McGill Univ., Montreal, Quebec, Canada). **Detection of organophosphorus insecticide residue in soil by biological and chemical methods and the effect of such residues on soil microarthropods.** *Diss. Abstr. Int.* B 36(10): 4839; 1976.

A bioassay method for insecticide residues in soil was developed using the larvae of *Euxesta notata* (Wiedemann). This method was used to determine the longevity of chlorfenvinphos, diazinon, fensulfothion, and fonofos in microplots under field and greenhouse conditions. The same materials were then studied for their longevity and effects on soil microarthropods in field plots. The maximum persistence of biologically detectable residue was found to be 15 weeks for chlorfenvinphos, diazinon, and fonofos and 12 weeks for fensulfothion. Fensulfothion, however, had the longest residual life in soil followed by fonofos, chlorfenvinphos, and diazinon in that order as determined by gas liquid chromatograph. Chlorfenvinphos had no effect on the number of mites in soil but decreased the number of Collembola. Diazinon had no effect on the number of Collembola. Fensulfothion reduced the number of Mesostigmata and predatory mites. Fonofos reduced the number of predatory mites and of Collembola. (Author abstract by permission. Microfiche copy of the thesis available from the National Library of Canada).

76-2998. Wishe, H. I. (New York Univ., New York, NY 10003). **The effect of aminotriazole on the thyroid gland and development of the white leghorn chick.** *Diss. Abstr. Int.* B 37(3): 1066-1067; 1976.

The present investigation was undertaken to ascertain the effects of aminotriazole (amitrole) on the thyroid gland and the development of the white leghorn chick. Two different dosages (0.5 g/kg and 1.0 g/kg of body weight) of aminotriazole were dissolved in a 0.9% sodium chloride solution and administered intraperitoneally on successive days to chicks from 3 to 40 days of age post hatching. In another experimental series, birds were injected with the same doses of aminotriazole through day 20 post hatching, at which time treatment with the drug was discontinued until the animals were sacrificed at days 27, 34, and 41. The controls gained more weight than the experimental chicks that were treated continuously with aminotriazole up to the time of sacrifice. The birds in the experimental group in which drug treatment was discontinued on day 21 showed a subsequent sharp increase in weight. By day 41, these experimentals weighed as much as or more than the controls. Following continuous administration of 0.5 g/kg and 1.0 g/kg of aminotriazole, the thyroid/body weight ratios increased. However, with the lower dosage, the ratios then decreased and leveled off by day 41, whereas with the higher dosage the thyroid/body weight ratios continued to show an increase. In both experimental groups, these ratios were always greater than those of the controls. When aminotriazole treatment was discontinued on day 21, the thyroid/body weight ratios decreased markedly, but never to the same low levels which were obtained in the controls. Histological exmaination of the thyroid glands revealed hypertrophy, hyperplasia and hyperemia of the glands in the animals receiving aminotriazole. The characteristic changes reported for other goitrogens were observed with aminotriazole. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 76-19,567.)

76-2999. Somers, J. D. (Univ. Guelph, Guelph, Ontario, Canada). **Influence of external application**

of herbicides on avian embryogenesis and reproduction: effect of egg encounter time. *Diss. Abstr. Int.* B 37(3): 1163; 1976.

The effects of herbicide contamination on avian embryogenesis and reproduction were evaluated subsequent to a spraying of 11.2 kg/ha of commercial formulations of 2,4-D, 2,4,5-T, and picloram onto hens' eggs at 0, 4 and 18 days of incubation. Females of the original hatch were bred to males from the same treatments to measure reproductive potential. The compounding consequences of a second year herbicide encounter were reviewed following the application of the original herbicides to eggs of the above matings. In relation to the controls, neither the herbicide applications nor the embryonic time of contamination affected the hatchability parameters or the incidence of terata in the 3 incubation studies. Similarly, post-hatch growth and mortality of chicks from herbicide sprayed eggs were comparable to that of the controls. The lack of embryonic or chick growth effects in second year studies suggested that both parental carryover and/or additional herbicide contact were of little significance. Evidence of sterility or feminization based on the testes, sperm count, and egg production data was not forthcoming. No alterations in feed consumption, feed efficiency, egg quality, or carcass analysis of the hens were found that could be associated with the herbicide treatments. Thus it appeared that the adult performance of either sex was not affected by any subacute herbicidal influence during organogenesis. (Author abstract by permission, abridged. Microfiche copy of the thesis available from the National Library of Canada.)

76-3000. Rand, G. M. (Texas A & M Univ., College Station, TX 77843). **The effect of exposure to a subacute concentration of parathion on the locomotor behavior of several freshwater fish.** *Diss. Abstr. Int.* B 37(3): 1079; 1976.

The effects of 24-hr exposure to a subacute concentration of parathion on locomotor behavior were examined in freshwater fish. Behavior was studied in response to a food odor in water flowing at 200 ml/min (odor/flow I) and 400 ml/min (odor/flow II) and water without odor flowing at these rates (flow I and flow II respectively) in a free choice situation. The odor/flow I combination was preferred and the odor/flow II was avoided prior to parathion in the goldfish. After expoxure to parathion odor/flow II became attractive. In sunfish prior to parathion exposure odor/flow II was more attractive than any other condition; following exposure the response to odor/flow II and flow II was avoidance, while odor/flow I remained attractive. Two weeks after exposure the relative response to the treatments was similar to that of unexposed fish. In bass prior to parathion exposure the odor/flow II was also more attractive than any other condition but the fish were unable to discriminate between odor/flow I and flow I alone. Following the exposure the fish became unable to discriminate between odor/flow II and flow I, whereas particularly odor/flow I and to a lesser extent flow II were avoided. The orientation behavior of goldifsh under uniform flow I conditions, in the absence of an odor, was modified, and the general activity in all experimental conditions was depressed following parathion exposure. (Author abstract by permission, abridged. Copies of the thesis are available form University Microfilms, Order No. 76-20,612.)

76-3001. Larsen, R. V. (Purdue Univ., Lafayette, IN 47907). **The placental transfer and teratology of pentachlorophenol in rats.** *Diss. Abstr. Int.* B 37(3): 1184-1185; 1976.

Pregnant rats were given oral doses of uniformly labeled ^{14}C-pentachlorophenol (PCP, 99.54% radiochemically pure) on day 15 of gestation. Two animals were sacrificed at 2, 4, 8, 12, 16, 24, and 32 hours post dosing. The activity present in the various tissues was determined by using liquid scintillation counting. Blood serum levels of activity reached a peak at 8 hours after dosing, while the peak levels of activity detected in the placentas and fetuses occurred at the 12 hour period. However, the total activity detected in the fetuses of any one maternal animal failed to exceed the purity limits (0.46% impurities) of the radiolabeled compound. Therefore, within the limits of this study, it cannot be stated that pentachlorophenol and/or its metabolites cross the placental barrier. A tissue distribution study was done on the animals killed at 12, 16, and 24 hr. The highest tissue levels of activity were noted at the 12 hour period, with the blood serum, kidney, placentas, ovaries, and liver containing the highest levels of activity, and the muscle and fetuses containing the lowest. No apparent fetal accumulation of pentachlorophenol and/or its metabolites occurred during the time studied. To determine if acute oral doses of pentachlorophenol cause fetal malformations, pregnant rats were given 60 mg pentachlorophenol/kg on one of the following days of gestation; 8, 9, 10, 11, 12, or 13. When the animals reached day 20 of gestation, they were sacrificed and the fetuses examined for malformations. Four malformed fetuses were observed in the treatment animals; 1/4 size dwarf (day 8), macrophthalmia (day 9), tailless (day 9), and exencephaly (day 9). No malformed fetuses were noted in the control animals. It was found that oral doses of pentachlorophenol administered on days 9 and 10 of gestation significantly ($p > 0.05$) affected fetal weights, while no effect was seen on fetal weights on days 8, 11, 12, and 13. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 76-21,072.)

76-3002. Appleton, H. T. (Author address not given). **The toxicological significance of paraoxon deethylation.** *Diss. Abstr. Int.* B 37(3): 1196; 1976.

The deethylation of paraoxon is a major metabolic pathway of parathion in several strains of male rats. The

initial product of paraoxon deethylathion, monoethyl paraoxon, is extensively metabolized to other products in vivo. The paraoxon *O*-deethylase of male rat liver microsomes was dramatically increased by pretreatment with enzyme inducing agents, while other paraoxon-degrading systems were less markedly affected. Prior to induction, hepatic *O*-deethylase activity was greatly inferior to the various hydrolytic enzymes, but nearly equal levels of both enzyme systems were found after induction. This, however, resulted in only a slight increase in the in vivo production of monoethyl paraoxon. In situ studies of hepatic parathion and paraoxon metabolism revealed that paraoxon degradation proceeded primarily by *O*-deethylation within the livers of both inducer-treated and non-treated male rats. Paraoxon deethylation was shown to be important in female rats and male mice, as well. The coupling of oxidative enzymes of parathion activation and paraoxon degradation within the liver supports the theory that the liver acts as an organ of detoxification in the metabolism of parathion. (Author abstract by permission. Copies of the thesis are available from University Microfilsm, order No. 76-20,313.)

76-3003. Georgiev, P.; Mirkova, E. (Vet. Inst. Infectious Parasitic Dis., Sofia Ctr. Hyg., Med. Acad., Sofia, Bulgaria). **Changes in the activity of some placental enzymes and isozymes following treatment with the fungicide basfungin.** *Dokl. S'kh. Akad. Sofia* 8(1): 75-78; 1975. (26 references)

Pregnant Wistar rats were treated on the thirteenth day of gestation with basfungin (methylmetiram) at a dose level of 125-1000 mg/kg. On the twenty-first day of gestation one placenta was taken from each animal and studied. The activities of thermostable alkaline phosphatase (TAP), glucose-6-phosphate dehydrogenase (G-6-PDH), and lactate dehydrogenase (LDH) were inhibited in a dose-dependent fashion by basfungin at levels equal to or greater than 500 mg/kg. Four LDH isozymes were detected in animals treated with 500 mg/kg or more of basfungin which were not detected in untreated controls. The fast-moving anode isozymes underwent considerable changes, and a considerable inhibition of isozyme 1 was evident. The data indicates a functional insufficiency of the placenta caused by the toxic effect of basfungin; this is apparently related to the teratogenic effect of the fungicide.

76-3004. Hanada, S. (Fac. Pharm., Meijo Univ., Nagoya, Aichi, Japan). [**The dietary habits of the Japanese and antifungal treatment of citrus fruits with biphenyl and *o*-phenylphenol.**] *Eiyo To Shokuryo (Food Nutr.)* 29(1): 67-68; 1976. (Japanese)

It was found that biphenyl, administered to rats, is transformed to *o*-phenylphenol. *o*-Phenylphenol (OPP) showed strong antimicrobial activity and had a slightly greater acute oral toxicity, as indicated by an LD50 of 2.7 g/kg. The use of *o*-phenylphenol as an antiseptic for citrus fruits was considered unsuitable according to the toxicity findings and Japanese dietary habits. OPP showed positive mutagenicity in *Salmonella* and *Escherichia coli* as contrasted with biphenyl. Daily painting of an acetone solution containing 5-10 mg produced reddening and ulcer-like symptoms on the backs of rats and the ears of rabbits by the third day. Inhalation of OPP killed some mice by alveolar congestion. OPP penetrated into the peel and pulp of Satsuma orange fruits, and it was not removed by washing with synthetic detergent. The use of *o*-phenylphenol on citrus fruit in Japan seems inadvisable because of the large quantities of fresh citrus fruit consumed by the Japanese.

76-3005. Godfrain, J. C.; Rico, A. G.; Burgat-Sacaze, V.; Braun, J. P.; Benard, P. (Lab. Pharm. Toxicol., Ecole Natl. Vet., 31076 Toulouse Cedex, France). **Contribution a l'etude des effets toxiques du methoxy-ethyl-mercure chez la caille: influence de l'anorexie.** [**Contribution to the study of toxic effects of methoxyethylmercury in the quail: effect of anorexia.**] *Eur. J. Toxicol. Environ. Hyg.* 9(2): 79-98; 1976. (38 references)

Methoxyethylmercury toxicity was studied in the quail. The experimental birds were fed contaminated wheat (20 ppm Hg) for 10 or 20 days. Following this exposure the birds were fasted for 3 days. The test was lethal for a number of the intoxicated animals, but not for controls. Mercury clearance was modified by anorexia. After fasting there was a redistribution of the mercury with highest concentrations in the liver and kidneys. Uric acid, urea, and GOT levels in the blood were the most severely altered parameters. Transient high blood uric acid levels in intoxicated and anorectic animals may have resulted from kidney malfunctions. A possible effect was evaluated of methoxyethylmercury on glyconeogenesis.

76-3006. Ogata, S. (Ichikawa Hosp., Tokyo Dent. Coll., Ichikawa, Chiba, Japan). [**Experimental studies on chronic organophosphorus intoxication using beagles. With special consideration of diagnosis.**] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 70(8): 903; 1976. (Japanese)

Fenitrothion was administered orally to 3 male beagles daily at 5 mg/kg for 10 mo. Conspicuous and prolonged reduction of erythrocyte cholinesterase activity was seen without any difference in peripheral hematologic and hemobiochemical parameters compared to controls. According to ophthalmologic examinations, the corneal radius of curvature decreased conspicuously in conjunction with body weight gain in both treated dogs and controls; however, it remained at a constant value after the body weight gain stopped. No conspicuous tendency to myopia was observed, nor was any change in the fundus on treated dogs. The concentration of fenitrothion in the dogs' blood at the end of the experiment was about 0.001 μg/ml, as determined by gas chromatography with FPD. These findings, especially the concentration of fenitrothion in the blood, indicated the necessity of being careful

because of the contamination peaks in the gas chromatogram.

76-3007. Hattori, K. (Author address not given). [**Toxicity of difenphos in amphibians.**] *Hokkaidoritsu Eisei Kenkyusho Ho (Rep. Hokkaido Inst. Public Health)* 24: 152-153; 1974. (4 references) (Japanese)

The toxicity of difenphos (temophos, Abate) was studied in *Rana chensinensis* and *Hynobius retardatus*. Using a 5% abate emulsion, aqueous solutions at various concentrations were prepared. The larvae and eggs of the frog and salamander were placed in these solutions at room temperatures of 17 to 18°C, and their growth was observed. The larvae used were about 20 days old, and the average weight of the tadpoles was 0.125 g with an average length of 21.4 mm. The average weight of the salamander larvae was 1.97 g, with an average length of 19.71 mm. No tadpoles died within 24 hr in difenphos solutions up to 3.42 ppm, while all tadpoles died in 5.90 ppm difenphos solution. The LC50 for tadpoles was 4.18 ppm. No salamander larvae died within 24 hr in difenphos solutions up to 3.79 ppm; however, all died in difenphos solutions at greater than 4.17 ppm concentrations. The LC50 for salamander larvae was 3.97 ppm. The growth of the frog eggs stopped completely in 2 days when they were placed in 100 ppm difenphos solution, and none of the eggs hatched after 10 days. When eggs were placed in 10 ppm solution growth was delayed, and 91 out of 100 hatched tadpoles died after 10 days. Only 5 out of 123 hatched tadpoles died and 118 tadpoles survived after 10 days when they were placed in a 1 ppm difenphos solution. Similar results were observed for the salamander eggs when they were placed in a 100 ppm solution, and none of the eggs hatched. All eggs hatched when the salamander eggs were grown in a 10 ppm solution; however, 44 of 104 hatched larvae survived beyond 10 days in this solution. When the salamander eggs were grown in a 1 ppm difenphos solution, no difference was observed in their growth from the results obtained in the control experiment in which the eggs were grown in water without difenphos. No toxic effect of difenphos on the growth of the amphibia was observed within the usage standard of the difenphos concentration, 1 ppm.

76-3008. Ryum, S. K. (Author address not given). [**Organophosphorus insecticides.**] *Hwahak Kwa Huahak Kongop (Chem. Chem. Ind.)* 17(2): 97-103; 1974. (26 references) (Korean)

The toxicity of phosphamide (dimethoate), an organophosphorus insecticide, was studied. The toxicity of phosphamide to warm-blooded animals was less than that to insects. The dermal toxicity is lower than the oral toxicity: the dermal and oral toxicities (LD50) of phosphamide in rat were 215 to 245 mg/kg, and 610 mg/kg. These values were lower than those for any other insecticides except trichlorfon. After 12 days the amount of phosphamide present on the leaves of corn, bean, and cotton declined to 3.5-30% of the initial amount sprayed. Phosphamide was readily degraded in the plants, with a half life of 2 to 5 days. Phosphamide metabolism in animal bodies was similar to that in plants. The amount of residual phosphamide in plants depended upon manufacturing methods of the phosphamide, the kinds of plants sprayed, and the season. The effect of phosphamide on serum cholinesterase activity in chickens and fish was very slight. When chickens were fed with 30 ppm phosphamide for 59 weeks, they lost their appetite, but there was no effect on laying ability. The phosphorus compound remained in the soil for about 1 to 12 wk, and environmental pollution was slight.

76-3009. Ogawa, E. (Sch. Pharmacol., Fac. Med., Gumma Univ., Maebashi, Gumma, Japan). [**The effect of dimercaptosuccinic acid on the excretion of phenylmercury acetate.**] *Igaku To Seibutsugaku (Med. Biol.)* 91(5): 357-382; 1975. (9 references) (Japanese)

Radiolabeled (^{203}Hg) phenylmercury acetate was administered intraperitoneally or orally to groups of ddN strain adult male mice. The total and excreted radioactivity were determined for 3 days after administration along with the distribution of radioactivity in various organs after 3 days. In parallel experiments dimercaptosuccinic acid was given at 1 and 5 mg subcutaneously and 10 mg orally, thiomalic acid at 5 mg subcutaneously and 10 mg orally, 2-mercaptopropionylglycine at 10 mg orally, *N*-acetylpenicillamine at 5 mg subcutaneously, and dithiothritol and pyridoxine-4-sulfhydryl at 5 mg subcutaneously once a day for 3 days. It was found that dimercaptosuccinic acid was most efficient in eliminating radioactivity from the mouse body, followed by thiomalic acid. In larger amounts, 2-mercaptopropionyl glycine and *N*-acetylpenicillamine were partly effective. Pyridoxine-4-sulfhydryl reduced that radioactivity only in the kidney, while dithiothreitol increased the radioactivity in the brain.

76-3010. Atallah, Y. H.; Whitacre, D. M.; Dorough, H. W.* (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Metabolism of the herbicide methazole in lactating cows and laying hens.** *J. Agric. Food Chem.* 24(5): 1007-1012; 1976. (7 references)

[*phenyl*-^{14}C]Methazole [2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione] was fed to hens at 0.3, 1.0, and 3.0 ppm in the diet for 14 days, and administered daily to cows via gelatin capsule at dosages equivalent to 0.5, 2.5, and 10 ppm in the diet for the same period. Maximum residues in the body after 14 days were located in the liver and were 0.026, 0.101, and 0.201 ppm of [^{14}C]methazole equivalents for hens at the three feeding levels; for cows, the residues in liver were 0.016, 0.065, and 0.406 ppm. Eggs contained ^{14}C-labeled residues at 3% the dietary parts per million levels and milk at about 0.3% that in the diet. Radiocarbon in tissues, eggs, milk, and excreta was characterized by extraction and partitioning behavior, and by TLC analysis of metabolites extractable into organic solvent. Major components of the latter were 3-(3,4-dichlorophenyl)-1-methylurea, 3,4-

dichlorophenylurea, and *N*-(2-hydroxy-3,4-dichlorophenyl)urea and its 4,5-dichlorophenyl analogue. (Author abstract reprinted by permission of the American Chemical Society)

76-3011. Feung, C. S.; Hamilton, R. H.; Mumma, R. O.* (Dep. Entomol. Biol., Pestic. Res. Lab., Grad. Stud. Cent., Pennsylvania State Univ., University Park, PA 16802). **Metabolism of 2,4-dichlorophenoxyacetic acid. 10. Identification of metabolites in rice root callus tissue cultures.** *J. Agric. Food Chem.* 24(5): 1013-1015; 1976. (16 references)

The metabolism of 1-^{14}C-labeled 2,4-dichlorophenoxyacetic acid (2,4-D) was investigated in rice root callus tissue and found to be quite different from other callus tissue. After 7 days incubation, 39.7% of the applied dose was found in the water-soluble and 15.9% in the ether-soluble tissue fractions. The residue and media contained 5.2 and 25.2%, respectively. Almost all of the ether-soluble label was unmetabolized 2,4-D. The major metabolites in the water-soluble fraction of rice root callus tissue appear to be sugar esters of 2,4-D (carboxylic glycosides), since β-glycosidase releases mainly 2,4-D. Amino acid conjugates of 2,4-D, which were major metabolites in other callus tissues (especially dicots), were not detected. The two ring hydroxylated aglycones, 4-hydroxy-2,3-dichlorophenoxyacetic acid and 4-hydroxy-2,5-dichlorophenoxyacetic acid, represented only 0.4% of the applied dose in rice root callus tissue, but in other callus tissues (especially the monocot corn) these ring hydroxylated metabolites were major metabolites of 2,4-D. (Author abstract reprinted by permission of the American Chemical Society)

76-3012. Khorram, S.; Knight, A. W. (Dep. Land, Air Water Resour., Water Sci. Engn. Sect., Univ. California, Davis, CA). **Effects of temperature and kelthane on grass shrimp.** *J. Environ. Eng. Div. Am. Soc. Civ. Eng.* 102(EE5): 1043-1053; 1976. (25 references)

The effect of temperature and the organochlorine insecticide kelthane on survival of grass shrimp (*Crangon franciscorum*, Stimpson) and the effect of the interaction of temperature and kelthane concentration were investigated on the survival of the test organism. The main effects of temperature and kelthane as well as their combination on shrimp survival were highly significant for all test periods of 24, 48, and 72 hr. The two factors were not independent; the differences among temperature effects were not the same for each level of kelthane concentration, and the difference in kelthane effects varied for each temperature. The kelthane concentration lethal to a certain percentage of the shrimp decreased as temperature increased. Conversely, the temperature lethal to a certain percentage of the population decreased as the kelthane concentration increased. When increases in both kelthane concentration and temperature were accomplished, a very low percentage of the population survived. As exposure time increased under the same conditions of temperature and kelthane concentration, survival decreased.

76-3013. Miyamoto, J.; Hosokawa, S.; Kadota, T.; Koda, H.; Arai, M.; Sugiura, S.; Hirao, K. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Studies on cholinesterase inhibition and structural changes at neuromuscular junctions in rabbits due to subacute administration of fenitrothion.** *J. Pestic. Sci.* 1(3): 171-178; 1976. (27 references)

The effects of sumithion (fenitrothion) on cholinesterase inhibition and neuromuscular junction structures in rabbits were studied. Sumithion was fed for 6 months at 10 and 3 mg/kg/day to male rabbits. Significant depression of plasma and erythrocyte cholinesterase activities was noted. Brain cholinesterase activity was also depressed at higher concentrations. No changes were found in Musculi rectus medialis cholinesterase by either biochemical or histochemical test methods. Fine structure of the neuromuscular junctions of the tissue was not changed. No adverse effects were observed on behavior, mortality, hematology, clinical biochemistry, organ weight, or histopathology of the major organs or tissues of the rabbits. Therefore cholinesterase inhibition is the most sensitive biological parameter for diagnosing intoxication by organophosphorus anticholinesterase compounds.

76-3014. Mihara, K.; Nambu, K.; Misaki, Y.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Metabolism of ^{3}H-Cremart in rats and plants.** *J. Pestic. Sci.* 1(3): 207-218; 1976. (24 references)

Absorption, distribution, excretion, and biodegradation of ^{3}H-Cremart labeled at the phenyl group were studied in rats, bean plants, rice plants, and carrots. Cremart underwent rapid degradation and excretion on oral and i.v. administration to Sprague-Dawley rats. No radioactive residues persisted in tissues or organs. After oral administration of 70 mg/kg, substantially all administered radioactivity was excreted over 7 days, primarily via the urine. Less than 1% was excreted in feces. No oxygen analog was excreted, but it was detected in the animal body. Major urinary metabolites were 3-methyl-6-nitrophenol, 3-hydroxymethyl- 6-nitrophenol, and 3-carboxy- 6-nitrophenol, free and conjugated with sulfuric and glucuronic acid. Trace amounts of the metabolites carrying intact P-O-C (aryl) linkages were found in the excreta. Cremart is therefore biodegradable and does not leave persistent residues in mammals. When added to a nutrient solution at 2.0 ppm, Cremart was steadily absorbed into bean plants, rice plants, and carrots. Most was present in the roots. After 10 days, cremart accounted for 70 to 85% of the ^{3}H absorbed in the plants. Metabolites included Cremart-oxon, 3-methyl- 6-nitrophenol, its glucoside, and *O*-ethyl *O*-(3-hydroxymethyl-3-nitrophenyl) *N*-*sec*-butylphosphoramidothioate.

76-3015. Yoshioka, H.; Miyamoto, J. (Dep. Res., Pestic. Div., Sumitomo Chem. Co., Ltd., Takarazuka, Hyogo, Japan). [**Synthetic pyrethroids. Part 2.**] *Kagaku To Seibutsu (Chem. Biol.)* 14(8): 549-556; 1976. (74 references) (Japanese)

Metabolism and degradation of a series of synthetic pyrethroids such as tetramethrin, resmethrin, phenothrin, and permethrin on the molecular level and the environment were described, including oxidative metabolism in the chrysanthemic acid moiety and in the alcohol moiety, hydrolysis by liver microsomal enzymes, and photolysis. Mammalian toxicity of synthetic pyrethroids is evidenced by symptoms such as agitation, contracture, and ataxia of short duration. The LD50 values in male mice range from 152 mg/kg of *cis*-resmethrin to greater than 5000 mg/kg for (-) *trans*-phenothrin. The acute dermal toxicity, skin irritability, local allergic activity, and inhalation toxicity of synthetic pyrethroids are very low. Experimental results indicate a lack of teratogenicity, subacute oral toxicity, and mutagenicity. It was noted that the fish toxicity of synthetic pyrethroids is fairly high compared to that of natural pyrethroids, i.e., (±) *trans*-, (±)*cis*-, and isomeric mixtures of phenothrin, tetramethrin, and furamethrin show TLM (48 hr) of about 0.1 ppm against *Oryzias latipes*.

76-3016. Seto, H. (Div. Study Environ. Sanit. Public Health Res. Lab., Tokyo Metrop. Off., Tokyo, Japan). [**Effect of DDT on the mechanism of humoral immunity in the mouse.**] *Kankyo Osen (Iwayuru Kogai) Ni Kansuru Chosa Kenkyu (Rep. Stud. Environ. Pollut.)* 2: 187-188; 1975. (Japanese)

After short-term (0.275 and 27.5 mg/kg/day for 5 days in salad oil) and long term (0.5 and 50 ppm in daily feed for 12 weeks) oral administration of *p,p'*-DDT to groups of mice, a predetermined amount of sheep erythrocytes was injected into the mice intraperitoneally. The second injection was given 10 days after the first. After several days 20 mice from each group were sacrificed, their spleens were removed, and the number of hemolytic spot forming cells (PFC) was counted. No effects of *p,p'*-DDT were found on the lymphatic organs such as spleen and thymus. Antibody forming ability was seen on the 5th day in mice administered *p,p'*-DDT for a short time, as indicated by the indirect PFC values. After long-term administration of *p,p'*-DDT at 50 ppm, direct PFC of 195 and indirect PFC of 75 clearly evidenced antibody formation. However, no effect of *p,p'*-DDT was found on the secondary immunity reaction. It was anticipated that the intake of minute amounts of *p,p'*-DDT for a long time might derange the physiological function, including the organism's defense mechanism.

6-3017. Strateva, A. (Inst. Hyg., Industrial Hygiene and Occupational Diseases, Medical Academy, Sofia, Bulgaria). **Khigienno-toksikologichno prouchvane na pestitsida ramrod s ogled na khigiennoto mu normirane vyv vodata.** [**Sanitary and toxicological study of the pesticide ramrod: tolerances in water.**] *Khig. Zdraveopaz.* 27(1): 30-34; 1974. (22 references) (Bulgarian)

Pesticides are widely used but should be replaced by other control means that would be completely safe for humans. The following measures are being undertaken to achieve that objective: research, sanitary standardization, and the introduction of pesticides which are less dangerous to humans. The available data support the contention that the herbicide Ramrod (propachlor) is such a compound. It is an aromatic amide from the group of anilides; its LD50 in the rat is 1200 mg/kg body weight. Its metabolism was studied in several kinds of plants. Only general principles governing metabolism in the human body are known. Compounds from the group of aromatic amines (Ramrod is among these) degrade according to these principles. From the sanitary and toxicological points of view, however, Ramrod has not yet been investigated sufficiently.

76-3018. Editorial Committee on New Agricultural Chemicals (Agric. Chem. Inspect. Stn., Min. Agric. For., Kodaira, Tokyo, Japan). [**Recently registered new agricultural chemicals (pesticides).**] *Kongetsu No Noyaku (Agric. Chem. Mon.)* 20(11): 96-100; 1976. (Japanese)

Dimethylvinphos powder, wettable powder, granules, and EC, temivinphos wettable powder, granules, and EC, and pirimicarb EC have recently been introduced. The acute oral LD50 of the active ingredient of dimethylvinphos, 2-chloro-1- (2,4-dichlorophenyl) vinyl dimethyl phosphate, is 200, 220, 210, and 155 mg/kg in male mouse, female mouse, male rat and female rat; that of temivinphos, 2-chloro-1- (2,4-dichlorophenyl) vinyl methyl ethyl phosphate, is 250, 210, 120, and 150 mg/kg in both sexes of mouse and rat; and that of pirimicarb, 2-dimethylamino- 5,6-dimethylpyrimidine- 4-yl dimethylcarbamate, is 147 mg/kg in the female rat. These data were determined at the School of Hygiene, Tokyo Dental College. The TLm(48 hr) value for the a.i. of dimethylvinphos and of temivinphos in young carp is 2.3 ppm and 0.80 ppm according to the manufacturer.

76-3019. Claude, J.; Graillot, C.; Truhaut, R. (Cent. Rech. Toxicol., Fac. Sci. Pharm. Biol., Univ. Rene Descartes, 75006 Paris, France). **Use of the golden hamster in toxicology.** *Lab. Anim. Sci.* 26(2): 274-280; 1976. (37 references)

A comparative study was made of the influence of p.o. administration of a number of organochloride insecticides on the rat, mouse and hamster. The hamster's tolerance to DDT, DDD (TDE) and DDE is so great that LD50 cannot be determined. The LD50s for the hamster exposed to aldrin, dieldrin, lindane, and chlordane are several times greater than those obtained for the rat and mouse. For endosulfan and heptachlor the toxicities in the hamster are similar to those in the rat and the mouse. These findings underline the differences in sensitivity toward substances of the same chemical family which can

appear among animal species belonging to the same order. Long-term effects of sublethal doses of organochloride insecticides on biochemical pathways were evaluated, with particular reference to liver function. The details of the induction of drug-metabolizing enzymes in the hamster and in the rat were also evaluated.

76-3020. Stranks, D. W.; Hulme, M. A. (Eastern Forest Prod. Lab., Ottawa, Ontario K1A OW5, Canada). **The mechanisms of biodegradation of wood preservatives.** *Mater. Org. Beih.* 3: 345-353; 1975. (49 references)

Known mechanisms for biodegradation of wood preservatives are reviewed, and the organisms responsible are identified. Biodegradation of these chemicals may occur rapidly under specific conditions. The most important factors for this rapid degradation include low concentration and the presence of cometabolites. Even materials such as PCP can then be rapidly metabolized in soil. Preservatives fixed in treated wood are generally biodegraded slowly. Most extensive colonization of preservative-treated wood has been observed with microorganisms other than basidiomycetes. A common mechanism of detoxification particularly with inorganic preservatives may be removal of toxicants by the hyphae. Only broad mechanisms have thus far been constructed for the biodegradation of most wood preservatives, and few of the responsible organisms have as yet been identified. The literature is discussed in terms of the organisms responsible and the detoxification pathways in evidence.

76-3021. Kuroda, K. (Hokkaido Fish. Assoc., Abashiri City, Japan). [**Lethal effect of pesticides on parr.**] *Mizu Shori Gijutsu (Water Purif. Liquid Wastes Treatment)* 15(8): 783-793; 1975. (15 references) (Japanese)

The lethal effects of the pesticides tachigaren (hymexazole), ekatin, phosvel (leptophos), green daisen M (mancozeb) and pentagen (PCNB) on parr were studied. Each of the pesticides was dissolved in water in which four 6-8 mo. old parr weighing 2.8 to 3.1 g were placed and deaths were recorded for 48 hours. The amount of dissolved oxygen in the water was maintained above 2.0 ppm. The lethal effect of phosvel was the strongest; 1 of 4 parr died within 48 hr when placed in an 0.007 ppm phosvel solution. All 4 parr died in an 0.056 ppm phosvel solution. The effects of pentagen and tachigaren were slighter. No deaths occurred in 100 ppm pentagen solution, and 1 of 4 parr died in a 200 ppm pentagen solution. All four parr died in a 300 ppm solution. No parr died in a 100 ppm tachigaren solution. When a 140 ppm tachigaren solution was used, all four parr died within 16 hr.

76-3022. Kuroda, K. (Hokkaido Fish. Assoc., Abashiri City, Japan). [**Lethal effect of pesticides on Saghalien trout fry.**] *Mizu Shori Gijutsu (Water Purification Liquid Wastes Treatment)* 16(5): 441-448; 1975. (Japanese)

The lethal effect of pesticides on Saghalien trout fry was examined. Pesticides included tachigaren (hymexazole), ekatin, phosvel (leptophos) green daisen M (mancozeb), pentagen (PCNB), and diazinon. One group, comprising four trout fry weighing about 1.3 g, was placed in a bath containing an aqueous solution of each pesticide. The lethal effect was monitored for 48 hr. The concentrations of pesticides that revealed lethal effects were 75 ppm pentagen, 0.4 ppm green daisen, 110 ppm tachigaren, 300 ppm phosvel, 0.011 ppm diaziron, and 81. ppm ekatin. The pesticide concentration that killed all trout fry within 48 hr was 90 ppm pentagen, 0.5 ppm green daisen, 120 ppm tachigaren, 500 ppm diadainon, 0.028 ppm phosvel, and 9.5 ppm ekatin. When 0.1 to 0.2 ppm of a detergent was added to the solution of each pesticide, the lethal effect was increased. Two of four trout fry died in 100 ppm tachigaren solution with 0.1 ppm detergent. All four trout fry died in 200 ppm diazinon solution, 50 ppm pentagen solution, and 0.3 ppm green daisen solution when the solutions contained 0.2 ppm detergent.

76-3023. DeSerres, F. J. (Natl. Inst. Environ. Health Sci., Research Triangle Park, NC). **Prospects for a revolution in the methods of toxicological evaluation.** *Mutat. Res.* 38: 165-176; 1976. (39 references)

Many pesticides currently used are potent mutagens when tested in experimental organisms. The incidence of cancer cases arising from occupational exposure to pesticidal chemicals is expected to increase in the future. Ethylene oxide, captan, ethylene dibromide, heptachlor, and chlordane are only a few of the pesticides with proven mutagenic capabilities. Atrazine, while not mutagenic itself, is metabolized by corn plants to a derivative which caused reverse mutation and gene conversion in two different strains of yeast. One of the major crops in the US is corn, not only for human consumption, but also for silage for dairy cows and other farm animals. If atrazine has a mutagenic effect on the corn plant itself, this could create problems in the maintenance of the inbred strains used for seeding. In the broader field of environmental mutagenic hazards, assays are needed with a higher level of ascertainment that will not miss mutagenically active agents. Also, better ways to evaluate the risk of exposure to active agents for man are needed.

76-3024. Lambrev, Zh.; Adzharova, E. (Univ. Plovdiv, Bulgaria). **Vliyanie na pestitsidite vurkhu mitozite i mutiraneto.** [**Effect of pesticides on mitosis and mutations.**] *Nauch. Tr. Plovdiv Univ. (Ser. Biol.)* 12(4): 13-22; 1974. (6 references) (Bulgarian)

The effect of the following pesticides on mitosis was studied: Perozin 75B (zineb), Agria 1050 (fenitrothion), lindane A-28, Agriphlan (trifluralin) 24, and Zeazin 50 (atrazine). The pesticides were studied in relation to the

aberration and vacuolization of the cell nucleus in the root of the fodder pea (*Pisum arvense*). It was established that all five compounds inhibit cell divisions. In addition, lindane exhibited mutagenic effects. It caused the production of many fragments and tripolar cells. It also stimulated, while the other compounds retarded, the vacuolization of cells.

76-3025. Senior, E.; Bull, A. T.; Slater, J. H. (Biol. Lab., Univ. Kent, Canterbury, England). **Enzyme evolution in a microbial community growing on the herbicide dalapon.** *Nature* 263(5577): 476-479; 1976. (9 references)

A seven-membered microbial community capable of utilizing the herbicide dalapon has been isolated by continuous-flow enrichment culture. The composition of this community has remained remarkably stable over thousands of hours in a dalapon-limited chemostat. During this period, however, one member of the community, *Pseudomonas putida*, acquired the ability to grow on Dalapon through the evolution of an extant dehalogenase. (Author abstract by permission)

76-3026. Iwasaki, I. (Fac. Med., Okayama Univ., Okayama, Japan). [**Symptoms of intoxication by organophosphorus and other pesticides: reader's question.**] *Nippon Iji Shimpo (Jpn. Med. J.)* (2731: 143; 1976. (Japanese)

In reply to a reader's question, the side effects of agricultural chemicals such as isoxathion, thiometon, dimethoate, fenitrothion, and benomyl, and household insecticide sprays are discussed. Toxicity criteria include acute toxicity, LD50 p.o. and s.c., some and interaction cases the human lethal doses. The parallelism of the toxic symptoms with the degree of reduction of cholinesterase activity was discussed. The major symptoms produced by organophosphorus pesticides were described with reference to the nervous system sites attacked by the pesticides. Benomyl has been reported to cause local irritation of the eyes, mucous membrane, and skin. Contact dermatitis and anaphylactic shock resulting in headache and disturbances of respiration, etc. were noted after inhalation of pyrethroid insecticides. Direct inhalation and direct contact, especially with injured skin, are to be avoided.

76-3027. Wakatsuki, S. (Saku Gen. Hosp., Usuda, Nagano, Japan). [**Animal experiments on pesticide residues in living organisms and on the occurrence of intoxication symptoms.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 48; 1976. (Japanese)

Fenitrothion EC (2 mg/kg) was given to monkeys. The residue level of fenitrothion in the body reached a maximum value at 9-24 hr after administration, and had declined to a trace by the 5th day. The metabolites of fenitrothion in the urine were practically excreted within one-two days. The cholinesterase activity was inhibited slightly, 30% in serum and 10% in erythrocytes. After administration of fenitrothion EC equivalent to 30 mg/kg body weight to rats, residual fenitrothion in the rat's body was undetectable on the 5th day after administration, as in the monkey. When pure fenitrothion was administered at the same dosage the disappearance of its residues in the body took place somewhat faster. The restoration of cholinesterase activity took place somewhat slower when fenitrothion was administered as EC than when only fenitrothion was administered. The DTNB method of determination was more reliable than the Δ pH method.

76-3028. Horiguchi, N.; Wakatsuki, S. (Saku Gen. Hosp., Usuda, Nagano, Japan). [**Neurological studies on the treatment of intoxication due to organophosphorus pesticides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 48; 1976. (Japanese)

Electroencephalographic studies were carried out on animals acutely and chronically intoxicated by organophosphorus pesticides. In 50 rabbits intravenously injected with diazinon, the acute effects of diazinon appearing in the deep EEG and in the ECG resembled those caused by malathion and fenitrothion, both of which have P-S bonds. However, the time required to bring about paroxysmal waves was shorter than that for other organophosphorus pesticides, with a smaller threshold dosage. In monkeys chronically administered fenitrothion no abnormal findings were observed in monthly records of EEGs from the skin of the head. In another survey on farmers engaged in flowering plant culture in greenhouses, slow alpha waves were observed in 54% and 8% of men and women respectively while they were awake but resting. In general, abnormal EEG findings were more frequent in men than in women. As compared to the findings before pesticides application, the findings after application revealed some degeneration of the EEG, but there was no evidence of any neurological abnormality.

76-3029. Suzuki, K.; Wakatsuki, S. (Saku Gen. Hosp., Usuda, Nagano, Japan). [**Electron-microscopic studies on the treatment of intoxication by organophosphorus pesticide.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 48-49; 1976. (Japanese)

Male Wistar rats were administered fenitrothion at 30 mg/kg body weight. The relationship was observed between the effects of fenitrothion on the microstructure of several organs and its residues in the organs and the change in cholinesterase activity. Residues of fenitrothion in every organ became lower than the detection limit. Paralleling the degree of translocation of fenitrothion, histological alterations occurred in the kidney and the liver, beginning on the first day in the former and on the 5th day in the latter. The cholinesterase activity in the organs, once inhibited, returned to the original value after 5 days, when fenitrothion had almost disappeared. Electron microscopically observed alterations included swelling and reductions in numbers of synaptic vesicles in nerve end plate and several changes in the junctional fold. In mus-

cles, edematous changes were observed when emulsified fenitrothion was administered. The time required for recovery of inhibited cholinesterase activity was longer when emulsified fenitrothion was adminstered then when non-emulsified fenitrothion was given.

76-3030. Nomura, S. (Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Studies on the diagnostic standards for dermatitis due to pesticides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(1): 50; 1976. (Japanese)

In order to establish standard conditions, including pesticide concentrations, for patch tests in order to elucidate the causal substance of dermatitis in persons engaged in pesticide handling, studies were carried out on 23 pesticides. These pesticides were considered important from the viewpoint of rural medicine in Japan: cidial (phorate), chlorobenzilate, dicofol, anilazine, tetrachloroisophthalonitrile (chlorothalonil) maneb, zineb, monox, *p*-nitrophenyl 2,4,6-trichlorophenyl ether, paraquat-dichloride, trifluralin, mixture of sodium pentachlorphenate and sodium MCP, nitrofen, captafol, cartap, benomyl, thiophanate-methyl, and blasticidin S. First, it was established that it is necessary to use a uniform adhesive plaster for patch tests in order to avoid redness due to the plaster itself. Two levels of pesticide concentration were established; one was that actually applied, and the other was one tenth of that actually applied. The 10 times more concentrated level was considered; however, in view of the more severe skin response, this level should be more carefully examined.

76-3031. Suzuki, H.; Tsutsui, J.; Nakamura, Y.; Ito, Y.; Kato, H.; Nakabayashi, H. (Sch. Pathol., Fac. Med., Mie Univ., Tsu, Mie, Japan). [**Studies on toxicity of paraquat-dichloride. Part 2. The effectiveness of CDP-choline and superoxide dismutase for treatment.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 336-337; 1976. (Japanese)

The changes in lung lipids during intoxication by paraquat dichloride were examined and the effectiveness of CDP-choline (precursor of lecithin) and superoxide dismutase was studied for treatment of the intoxication. Four groups (5-10 animals each) of male rats were respectively treated. In the first group paraquat-dichloride (PD) was administered p.o. once at 100 mg/kg. In the second group, after giving 10 mg of CDP-choline, PD was administered once p.o. at 100 mg/kg, then CDP-choline was given daily at 10 mg. In group three, after giving 0.3 mg of superoxide dismutase (SOD), PD was administered p.o. at 100 mg/kg, then 0.1 mg of SOD was given daily. In the final group, after giving 10 mg of CDP-choline and 0.3 mg of SOD, PD was administered at the same dose rate, then 10 mg of CDP-choline and 0.1 mg of SOD were given daily. The mortality was 3/7 in group 1 within 20-100 min, 2/7 in group 2 after 48 hr, 4/9 in group 3 within 26-110 hr, and 2/10 in group 4 within 25-96 hr. The examination data on animals in the four groups showed no conspicuous difference between groups, except for group 4, in which normal lung tissue was seen in a small number of animals. The results showed the relative ineffectiveness of each drug; however, the combined treatment with CDP-choline and SOD showed some effectiveness.

76-3032. Matsushita, T.; Arimatsu, T.; Nomura, O. (Sch. Public Health, Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Experimental studies on the occurrence of allergic dermatitis due to organosulfur fungicides.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 344-345; 1976. (1 reference) (Japanese)

Animal experiments were carried out to elucidate various aspects of the occurrence of sensitized contact dermatitis due to dimethyldithiocarbamate fungicides, including ferbam and ziram. Experiments consisted of subcutaneous injection of the formulations into Wistar rats at 5 and 10 fold dilutions, closed patch tests on guinea pig skin to determine the minimum erythemal concentration, maximization test on guinea pigs, and examination of cross-sensitization between fungicides. All the fungicides tested produced considerable irritation, such as hyperemia, edema and necrosis. The minimal concentration causing skin redness was more than 5% for thiram, maneb, and zineb; more than 10% for ferbam, ziram, and sodium dimethyldithiocarbamate; and more than 20% for lime-sulfur mixture. The dimethyldithiocarbamate fungicides showed fairly high sensitizing ability; however, the degree of sensitization seemed to be lower than that of the ethylene bisdithiocarbamate fungicides such as maneb and zineb. Some cross-sensitization was observed between ferbam and ziram, and between thiram and ferbam/ziram, but none was observed between them and sodium dimethyldithiocarbamate. It was concluded that although dimethyldithiocarbamate fungicides cause sensitized contact dermatitis, the severity degree was less than that of ethylene bisdithiocarbamate fungicides.

76-3033. Matsushima, S.; Abe, E.; Sasaki, K.; Asanuma, N.; Nakano, T.; Fujita, K. (Japan Inst. Rural Med., Usuda, Nagano, Japan). [**Long-term administration test in dogs and monkeys with fentrothion at a minute dose rate. Part 1. Interim Report.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 510-511; 1976. (Japanese)

An interim report on a 3 years' administration experiment with fenitrothion in beagles and rhesus monkeys was presented at the 18 months point. Fenitrothion with a purity of 98.5% was administered p.o. once a week to 2 male and one female beagles, 14 months old, at a rate of 2 mg/kg b.w. in a capsule. It was also given to 2 male monkeys and one female about 3-4.5 years of age at rates of 1, 2, and 4 mg/kg b.w. in bananas injected with the solution in olive oil. After 18 months of administration, no abnormal findings were obtained in body weight gain, general condition, TP, GOT, GPT, ALP, LDH, CHOL, BUN, potassium, sodium, and chloride ions in the blood. No

change in serum and erythrocyte ChE activity was seen in beagles; however, in monkeys at 2 mg/kg the reduction of erythrocyte ChE activity began after 2 months of administration; the reduction was greater in the 4 mg/kg group. Residual fenitrothion was only detected after one day's administration of 4 mg/kg in one monkey (0.001 ppm). No conspicuous ophthalmologic changes were seen in beagles, while in monkeys of the 4 mg/kg group a tendency to myopia was seen. No conspicuous changes were found in the fundus and ophthalmic pressure. Excretion of metabolite(s) was detected only after one day in all the animals.

76-3034. Hoshijima, K.; Suzuki, H.; Narita, S.; Motojuku, H. (Sch. Hyg., Fukushima Pref. Med. Coll., Fukushima, Japan). [**Effect of administration of low toxicity organophosphorus pesticides on the spontaneous movement and forced movement of mice.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 512-513; 1976. (Japanese)

In order to observe the effects of organophosphorus pesticides on the central nervous system, the motor nerve conduction velocity from ankle to knee and the EMG may be examined. These values were determined in 12 cases of accentuated Achilles tendon reflexes in pesticide speed sprayer operators. However, no specific changes common to the cases of accentuated STR were seen. In another experiment, cyanox was administered p.o. to CFW male mice daily at 0.20, 0.04, and 0.02 mg/g b.w. with diet. After this administration no growth inhibition or retardation was observed. In the motility test, only the group given cyanox at 0.04 mg/g/day for 17 and 24 days showed an increase, indicating an irritating action on the central nervous system by cyanox. In the treadmill test all mice given cyanox showed reduced values, indicating severe reduction of the general physical strength under forced movement. Reduction of ChE activity was found in groups given cyanox at 0.2 mg/g/day. These findings suggest that the behavioral approach is effective for elucidating disturbances of the central nervous system.

76-3035. Kinebuchi, H.; Konno, N.; Yamauchi, T. (Sch. Pub. Health, Fukushima Pref. Med. Coll., Fukushima, Japan). [**Ascending paralysis in domestic fowls due to phosvel, an organophosphorus pesticide.**] *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 514-515; 1976. (2 references) (Japanese)

Reports have appeared in the foreign press on lethality and retarded ascending paralysis due to phosvel (leptophos). Studies were carried out to confirm these reports, using adult leghorn hens. Phosvel was forcibly administered p.o. at dose rates of 1250 mg/kg (first case only), 250 mg/kg, or 50 mg/kg b.w., respectively, in the first case using material (purity of 64.2%) extracted from the commercial formulation, and in the second case using purified material (purity of 93.7%). The results in the first case were: after 1-2 days of administration of 250 and 1250 mg/kg, all hens showed ataxia and loss of appetite. However, except for one death in the 1250 mg/kg group, they all recovered. On the 9th day, all hens given 1250 mg/kg suddenly showed abnormal walking. The abnormality began from streched toes, then ascended to the legs, resulting in crouching. Paralysis appeared in the 250 mg/kg group on the 12th day. All the animals in the 250 and 1250 mg/kg groups died between the 21st and 44th days due to paralysis of respiratory muscles and probably due to paralytic ileus. In the second case, abnormal walking appeared in 2 of 5 hens given 250 mg/kg on the ninth day of administration. One of them showed the same ascending paralysis, but in another hen the symptoms stopped at a moderate stage, and it is still alive after 160 days.

76-3036. Nishioka, T.; Fujita, T.; Nakajima, M. (Sch. Agric. Chem., Fac. Agric., Kyoto Univ., Kyoto, Japan). [**Determination of inhibition of the kinetic constant of acetylcholinesterase by substituted phenyl *N*-methylcarbamates.**] *J. Pestic. Sci.* 1(3): 239-247; 1976. (40 references) (Japanese)

The conditions and procedures were examined for determining the kinetic constants of acetylcholinesterase inhibition by (substituted) phenyl *N*-methylcarbamates. It was found that the experimentally obtained dissociation constant of the reversible enzyme-inhibitor complex, *Kd*, and the first order rate constant for carbamylated enzyme formation, *k*2, depend on the concentration of the inhibition according to currently adopted methods in the presence of a chromogenic substrate. Except for the case of equal ranges of concentation, the constant values obtained coincide well. However, at higher carbamate concentrations, no exact value could be obtained for the effects of the carbamate-enzyme complex and the addition of one more molecule of carbamate to the complex. *Kd* and *k*2 are decarbamoylation rate constants. Based on these premises, the experimental conditions for obtaining the constants, *Kd*, *K*2, and *k*3 with accuracy were described.

76-3037. Moroi, K.; Kuga, T. (Dep. Pharmacol., Inst. Biol. Activ., Chiba Univ., Chiba, Japan). [**Enzyme induction by prolonged administration of 2-chloro-1 (2,4,5-trichlorophenyl) vinyl dimethyl phosphate.**] *Nippon Yakurigaku Zasshi (Folia Pharmacol. Jpn.)* 72(4): 69; 1976. (Japanese)

2-Chloro-1- (2,4,5-trichlorophenyl) vinyl dimethyl phosphate was administered continuously for 10 days to male Wistar rats at daily dose rates of 60 and 250 g/kg. Reduction of cholinesterase activity was observed for 3 days; however, no futher reduction was observed thereafter. Induction of drug metabolizing enzymes in the liver was seen from the 3rd day, reaching a maximum on the 7th day and then declining. Even in the animals with increased enzymatic activity due to phenobarbital, the cholinesterase inhibiting activity of the organophosphate compound appeared very weak. It was presumed that the demethylation of the phosphate was mainly carried out by

glutathione-dependent transferase in the supernatant of the liver homogenate rather than by drug metabolizing enzymes. The metabolism of the organophosphate compound conspicuously accelerated in the groups pretreated with phenobarbital or with the organophosphate. The findings suggested that the continuous administration of 2-chloro-1- (2,4,5-trichlorophenyl) vinyl dimethyl phosphate induced the drug metabolizing enzyme system of liver microsomes and the transferase activity in the supernatant of the liver homogenate, resulting in reduction of the mammalian toxicity of the phosphate.

76-3038. Tanaka, T. (Dep. Survey, Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). [**Evaluation of the genetic safety of pesticides.**] *Noyaku (Agric. Chem.)* 23(3): 34-37; 1976. (Japanese)

Although the evaluation of mutagenicity of agricultural chemicals was not included in the national standards for evaluating safety of pesticide residues, studies for evaluating the mutagenicity of pesticides are being carried out energetically at the Institute of Environmental Toxicology in Tokyo. Referring to the reports of Mrak (1969) and others, the methods used at the institute are described. The evaluation system consists of primary and secondary screening and in vivo tests on mammals. The primary screening tests use microorganisms to detect the mutagens by reverse mutation and activation of metabolism, and the secondary tests use tissue culture and insects. The invididual methods and the species of microorganisms are almost the same as those used in the U.S.A.

76-3039. Kasai, T.; Sugimoto, T. (Biol. Res. Lab., Nippon Noyaku Co., Ltd., Nagano, Osaka, Japan). [**Toxicity of a fungicide, isoprothiolane, to aquatic animals and accumulation in them.**] *Noyaku (Agric. Chem.)* 23(3): 38-41; 1976. (Japanese)

The toxicity of isoprothiolane (diisopropyl-1 1,3-dithiolan- 2-ylidene malonate), a fungicide against rice blast, to freshwater fish ranges from TLm (48 hr) of 5 to 15.2 ppm. When 12% isoprothiolane granules were applied to a flooded paddy field at 4 kg/10 are, the maximum concentration was reached after 103 days, at 3 ppm. The acute toxic effects should not be fatal to fish cultured in flooded paddy fields; however, it is preferable not to use this fungicide in fish-culturing paddy fields. When fish were cultured in an aqueous solution of isoprothiolane, the active ingredient was rapidly absorbed into the fish body, amounting to 94 ppm (max.) after 24 hr. However, the content declined somewhat after 48 and 72 hr. After transferring the fish into pure water the content became undetectable at 72 hr. These and other results of experiments indicate that the degree of biological accumulation of isoprothiolane will cause no problems.

76-3040. Japan Soc. Plant Protect. (Tokyo, Japan). [**Presentation of recently registered agricultural chemicals—insecticides and miticides—colophonate, chlorpyrifos-methyl, amitoraz, and prothiophos.**] *IN: Noyaku Benran (Pesticides Manual), Japan Soc. Plant Protect., Tokyo* 1976, pp. 321-329. (Japanese)

Data presented on new insecticides and miticides included information on their mammalian and fish toxicity. The active ingredient of colophonate 5% granules and 3% coarse powder, *S*-(5-chloro-1,3-thiazolyl) methyl dimethyl phosphorothionate, has acute p.o. LD50 values of 1180, 1120, 760, and 830 mg/kg in male and female mice and male and female rats, respectively, and acute dermal LD50s of greater than 2000 mg/kg for both sexes of rat. The TLm (48 hr) for young carp is 7.8 ppm. This compound is highly toxic to the water flea (daphnia). The active ingredient of chlorpyrifos-methyl formulations, *O*,*O*-dimethyl *O*-(3,5,6-trichloro- 2-pyridyl) phosphorothioate, has acute p.o. LD50 values of 2254, 2030, 2476, and 1828 mg/kg in male and female mice and male and female rats respectively. Its acute dermal LD50 is greater than 2800 mg/kg for both sexes of both animals. The TLm for young carp is 2.1 ppm. It is highly toxic to the water flea. The active ingredient of amitoraz 20% EC, 3-methyl- 1,5-bis(2,4-xylyl)-1,3,5-triazopenta- 1,4-diene, has acute p.o. LD50 values of 1460, 1420, 450, and 370 mg/kg in male and female mice and male and female rats, respectiveLy. The TLm to young carp is 2.5 ppm. It is not so highly toxic to the water flea. The active ingredient of prothiophos powder and EC, *O*-2,4-dichlorophenyl *O*-ethyl *S*-propyl phosphorodithioate, has acute p.o. LD50 values of 940, 960, 1700, and 1750 mg/kg and acute dermal LD50 values of 1650, 1600, 3900, and 4100 mg/kg for male and female mice and male and female rats, respectively. The TLm to young carp is 9.5 ppm. It is highly toxic to the water flea.

76-3041. Japan Soc. Plant Protect. (Tokyo, Japan). [**Presentation of recently registered agricultural chemicals—fungicides.**] *IN: Noyaku Benran (Pesticide Manual Japan Soc. Plant Protect, Tokyo,)* 1976, pp. 330-333. (Japanese)

The active ingredient of 45% dibendazole WP methyl-1- (ω-cyanopentylcarbamoyl)- 2-benzimidazole carbamate, has an acute p.o. LD50 of more than 2500 mg/kg for both sexes of mice and rats and an acute dermal LD50 of more than 500 mg/kg for the rat. The TLm (48 hr) to young carp is 6.5 ppm. Toxicity to the water flea (daphnia) is low. The active ingredient of 12.5% dimethirimol solution (used against powdery mildew), *S*-butyl-2-dimethylamino- 6-methylpyridin-4-ol, has acute p.o. LD50 values of 1390 and 1250 mg/kg, respectively, for male mice and male rats, with lower dermal toxicity in both animals. The TLm (48 hr) to young carp is greater than 40 ppm. The toxicity to the water flea is also low.

76-3042. Japan Soc. Plant Protect. (Tokyo, Japan). [**Presentation of recently registered agricultural chemicals. Herbicides—dimuron, cyprazine, benoxazole-simetryn, cypromid, orthobencarb, and bentazon.**] *IN: Noyaku Benran (Pesticide Manual) Japan Soc. Plant Protect., Tokyo,*

Japan 1976, pp. 334-344. (Japanese)

The active ingredient of dimuron, 1-(α,α-dimethylbenzyl -3- (*p*-tolyl)urea, has acute p.o. LD50 values of more than 1400 and 4000 mg/kg for the male mouse and male rat, respectively. The TLm (48 hr) to young carp is over 40 ppm. Toxicity to the water flea is low. The active ingredient of cyprazine has acute p.o. LD50 values of 1270, 1030, 2780 and 2860 mg/kg in male and female mice and male and female rats, respectively. Irritation of rabbit skin and eyes is small. The TLm (48 hr) to young carp is 2.8 ppm. Toxicity to the water flea is low. The a.i. of cypromid, *N*-(3,4-dichlorophenyl) cyclopropanecarboxamide, has acute p.o. LD50 values of 1330, 1580, 2333, and 1860 mg/kg for male and female mice and male and female rats, and has acute dermal LD50 values of more than 4500 mg/kg for both sexes of mice and rats. The TLm (48 hr) to young carp is 3.5 ppm. Toxicity to the water flea is low. The active ingredient of orthobencarb, *S*-(2-chlorobenzyl) *N,N*-diethylthiocarbamate, has an acute p.o. LD50 of 1000 mg/kg for the male mouse. The TLm (48 hr) to young carp is 2.8 ppm. Toxicity to the water flea is relatively high. The active ingredient of bentazon, 3-isopropyl- 2,1,3-benzothiadiazine- (4)-on-2,2-dioxide, has acute p.o. LD50 values of 1320, 1130, and 1100 mg/kg for male and female mice and both sexes of rats. The acute dermal LD50 values are greater than 2500 mg/kg for rats of both sexes and more than 4000 mg/kg for rabbits of both sexes. The TLm (48 hr) to young carp is more than 40 ppm. Toxicity to the water flea is low.

76-3043. Fitzpatrick, G.; Sutherland, D. J. (Dep. Entomol., Drawer EM, Mississippi State Univ., Mississippi State, MS 39762). **Uptake of the mosquito larvicide temefos by the salt marsh snail, New Jersey—1973-74.** *Pestic. Monit. J.* 10(1): 4-6; 1976. (12 references)

Uptake of the mosquito larvicide temefos (Abate) by the salt marsh snail (*Melampus bidentatus* Say) in New Jersey was measured by gas-chromatographic analysis. Measurable quantities of temefos were found in the snails within 1 day after the first treatment with a 2 percent granular formulation, but 3 weeks elapsed before uptake occurred following treatment with a temefos emulsion. Residues in the snails exposed to the granular formulation were generally more than 10 times higher than those in snails exposed to the emulsion, although application rates of the granular formulation were only about three times higher than those of the emulsion. Residues in snails exposed to the emulsion fell below detectable levels less than 3 weeks after cessation of treatments although measurable amounts were found in snails exposed to the granular formulation for more than 5 weeks after the last treatment. The persistence of temefos in *M. bidentatus* suggests the potential for its movement through food webs exposed to the granular formulation. (Author abstract by permission)

76-3044. Galley, D. J.; Foerster, L. A. (Dep. Zool. Appl. Entomol., Imperial Coll., London SW7 2AZ). **Distribution and loss of phorate residues in the foliage of broad bean plants following root uptake of ^{14}C-labeled phorate.** *Pestic. Sci.* 7(3): 301-306; 1976. (14 references)

^{14}C-Methylene labeled phorate was added to nutrient solutions supplying the roots of young broad bean plants and after 24 hr absorption, fresh nutrient was substituted. The radiolabel accumulated at the leaf margins was initially associated with solvent-soluble toxic metabolites. Radiolabel extracted from foliage which developed after the treatment was mainly in water-soluble form. The maximum concentration of toxic material occurred in the marginal areas of the leaves after 5 or 6 days and in the central portions after 2 days. The concentrations declined to half of their peak values in 4—6 days from leaf-margin tissue and in 2 days from the central tissues. Water-soluble label did not accumulate to any significant extent. Most was found in the marginal areas but concentrations built up slowly, reaching a maximum after about 2 weeks and declining slowly thereafter. (Author abstract by permission)

76-3045. Bock, R.; Thier, W. (Inst. Anorg. Chem. Kernchem., Univ. Mainz, Germany). **Metabolism and fate of triazophos in rats.** *Pestic. Sci.* 7(3): 307-314; 1976. (11 references)

The excretion patterns and tissue residues were determined after single and repeated oral dosing of rats with triazophos-^{14}C. Within 4 days after a single oral dose 76.3% of the ^{14}C was exreted in the urine and 21.0% in the faeces. After daily application for 12 days 69.5-83.4% of the label was eliminated in urine and 30.9-18.1% in the feces. Following prolonged application, however, elimination is distinctly slower. Distribution of radioactive residues in organs and tissue in both test series showed no appreciable or critical concentrations of radioactivity, with the exception of the gastrointestinal tract (contents and walls). Unchanged triazophos and 1-phenyl-1,2,4-triazol -3- ol-3-^{14}C were excreted in the feces. Renewed release of other metabolites into the gastrointestinal tract apparently does not take place. The following metabolites are detected in the urine: urea-^{14}C (approx. 85% of the radioactivity excreted with the urine); and three compounds as conjugates with glucuronic acid, i.e. 1-phenyl-1,2,4-triazol -3- ol-3-^{14}C (approx. 3%), 1-phenylsemicarbazide-3-^{14}C (approx. 55), and semicarbazide-^{14}C (approx. 5%). Two further metabolites, so far unidentified, occurred in small quantities. (Author abstract by permission)

76-3046. Sundlof, S. F.; Hansen, L. G.; Welborn, M. E. (Coll. Vet. Med., Univ. Illinois, Urbana, IL 61801). **Pharmacokinetics of hexachlorobenzene in male laboratory beagles.** *Pharmacologist* 18(2): 149; 1976.

HCB distribution and excretion in male laboratory beagles were studied after both i.v. and p.o. administration. Sampling techniques were modified to include sequential fat biopsies in addition to frequent blood collections. HCB distributed primarily into adipose tissues even

though distribution appeared to be a multiphasic process. Fecal elimination resulting from biliary excretion accounted for the majority of the HCB eliminated from the body. Urinary elimination also occurred, but to a lesser extent. Both routes of excretion were governed by a zero order rate process.

76-3047. Leber, A. P.; Freudenthal, R. I.; Baron, R. L.; Curley, A. (Battelle Columbus Labs., Columbus, OH 43201). **In vivo metabolism of pentachloroaniline in Rhesus monkeys.** *Pharmacologist* 18(2): 153; 1976.

The metabolic fate of pentachloroaniline (PCA), a major metabolite of Terrachlor (PCNB) in animals, was studied in the male Rhesus monkey. A single oral dose of the fungicide was given at 100 μCi ^{14}C-PCA, 17.3 mg/animal. Within 5 days 41-75% of the compound was excreted. PCA plus 2 major metabolites were found in the urine. The structures of the 2 metabolites were identified. One of them is extractable into hexane. The feces contained only PCA. Peak concentrations in the blood were reached from 0.5 to 48 hr after dosing. The wide differences in maximum blood concentrations for individual animals are explained on the basis of the chemical reactivity of one of the metabolites.

76-3048. Goldsmith, L. A.; Carlson, G. P.; Fuller, G. C. (Dep. Pharmacol. Toxicol., Univ. Rhode Island, Kingston, RI 02881). **Toxicity and identification of parathion metabolites in fresh-water crayfish (*Cambarus*) and snail (*Viviparus*).** *Pharmacologist* 18(2): 170; 1976.

The toxicity of parathion in the crayfish and snail was tested. A 2.0 ppb concentration in water caused 100% lethality within 24 hr to crayfish; 12 ppm caused no visible effects in the snail. Thin layer chromatography and gas-liquid chromatography demonstrated the presence of parathion, paraoxon, and *p*-nitrophenol in the 1.0 μg and 0.2 μg ranges, resp. When various snail and crayfish tissues were incubated with parathion, no *p*-nitrophenol was found. If *p*-nitrophenol formation reflects the rate of paraoxon formation, the resistance of the snail to parathion is explained by the lack of formation of the toxic metabolite, paraoxon. Crayfish sensitivity to parathion is similar to that of lobsters. Both species, however, exhibit low rates of *p*-nitrophenol formation.

76-3049. Bulger, W. H.; Kupfer, D. (Worcester Fdn. Exp. Biol., Shrewsbury, MA 01545). **Interactions of *o,p'*-DDT with the high affinity estrogen binding proteins (EBP) in human mammary and uterine tumors.** *Pharmacologist* 18(2): 172; 1976.

The effect of *o,p'*-DDT on ^{3}H-estradiol binding to the 8S-EBP (estrogen binding proteins) was studied in human mammary and uterine tumors. The mammary tumor used in this study had a relatively high capacity for E_2 binding, 220 fmoles/mg protein. Both an 8S and a 4S EBP were demonstrated by a sucrose gradient analysis of this mammary tumor. At 48 and 96 μM *o,p'*-DDT inhibited the binding of the ^{3}H-E_2 to the 8S moiety by 40.7 and 61.6%, resp. The inhibition of E_3 binding to 4S required higher concentrations of the pesticide. *o,p'*-DDT also inhibited the binding of ^{3}H-E_2 to uterine adenocarcinoma. At 96 μM *o,p'*-DDT inhibited ^{3}H-E_3 binding to 8S moiety by 42%. In contrast, the 4S binding of ^{3}H-E_2 was not suppressed by either E_2 or *o,p'*-DDT. This last finding indicates no saturability of the 4S fraction.

76-3050. Mehendale, H. M. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Cent., Jackson, MS 39216). **Kepone-induced suppression of hepato-biliary function.** *Pharmacologist* 18(2): 195; 1976.

The effects of kepone (chlordecone) on biliary function were studied using isolated perfused rat liver preparations (IPRL), taken from animals treated with 200 ppm kepone in their diets for 8 days. A marked suppression of biliary excretion of ^{14}C-imipramine (IMP) was noted. The differences in the metabolism of IMP by control and treated livers were inadequate to account for the marked suppression of biliary elimination. Polar metabolite concentration in the perfusate was increased, probably due to a lack of biliary elimination and subsequent efflux from the liver. When kepone was added to the perfusate of control IPRL, no effects were observed. Biliary excretion of exogenously provided metabolites of IMP was suppressed in kepone treated livers. BSP clearance tests probably would not detect this biliary impairment as IPRL from treated animals and controls cleared BSP similarly. The kepone effect appears to occur at the locus of transport of metabolites to the biliary canals.

76-3051. Egle, J. L., Jr.; Gochberg, B. J.; Borzelleca, J. F. (Med. Coll. Virginia, Richmond, VA 23298). **The distribution of ^{14}C-kepone in the rat.** *Pharmacologist* 18(2): 195; 1976.

The distribution and time-concentration relation of kepone (chlordecone) in male Sprague-Dawley rats was studied. ^{14}C-Kepone was administered as a single dose, po, 80 mg/kg, in corn oil solution. Samples of blood, urine, feces, liver, kidney, and spleen were obtained at 1, 2, 3, 5, and 7 days after dosing. The greatest radioactivity was in the bile, followed in decreasing order of magnitude by blood, liver, feces, kidney, urine and spleen. Tissue concentrations reached maximum at 3 days after dosing. Levels in all tissues decreased at days 5 and 7. The possible effect of binding agents on levels of kepone in body fluids and tissues is under study. Rats receiving cholestyramine (200 mg) for five days after a single dose of kepone demonstrate lower levels of activity than with kepone alone at the end of the treatment. This is particularly true in the bile and liver.

76-3052. Wilson, D. W.; Hansen, L. G. (Coll. Vet. Med., Univ. Illinois, Urbana, IL 61901). **Pharmacokinetics of**

hexachlorobenzene in growing swine. *Pharmacologist* 18(2): 196; 1976.

Biopsy and non-destructive fat determinations were used to measure the distribution and elimination of HCB in fat and blood of growing swine after po and iv administration. HCB rapidly partitioned from blood and accumulated in fat. This accumulation was faster than the excretion of HCB from the body. After a single iv dose, the elimination rate was most rapid between 48 and 72 hr. Release from fat later became the rate-limiting factor for excretion. One half of the radioactive material excreted in the feces was HCB. Swine were 5- to 10-fold slower in excreting HCB than were dogs.

76-3053. Pohl, R. J.; James, M. O.; Fouts, J. R.; Bend, J. R. (NIEHS, NIH, Research Triangle Park, NC 27709). **Xenobiotic metabolism in marine fish treated with 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD), 3-methylcholanthrene (3-MC), or 1,2,3,4-dibenzanthracene (DBA).** *Pharmacologist* 18(2): 207; 1976.

The effects of TCDD, 3-MC, and DBA on hepatic microsomal benzo(a)-pyrene hydroxylase (AHH) activity in the little skate (*Raja erinacea*) were studied. TCDD, 3-MC, and DBA were given ip, and 3-MC was also given po. Up to a 20-fold increase in hepatic microsomal benzo(a)-pyrene hydroxylase activity was noted. No increase in benzphetamine *N*-demethylase activity was noted in liver microsomes of the treated fish. Aniline hydroxylase and 7-ethoxycoumarine *O*-deethylase activities were increased. Increased AHH activity was also noted in two teleosts, the winter flounder (*Pseudopleuronectes americanus*) after po TCDD administration and in the sheepshead (*Archasargus probatocephalus*) after ip 3-MC. These treatments caused no increase in cytochrome P-450 content of little skate or sheepshead hepatic microsomes. Neither was any effect noted on hepatic microsomal epoxide hydrase or soluble fraction glutathione *S*-transferase activity, with styrene oxide as substrate, in TCDD-treated little skate or 3-MC-treated sheepshead.

76-3054. Yoshihara, S.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Cumene hydroperoxide dependent parathion metabolism by purified rat liver cytochrome P-450.** *Pharmacologist* 18(2): 210; 1976.

Evidence is presented to support the fact that the sulfur atom released in the metabolism of parathion to paraoxon binds predominantly to cytochrome P-450. Cumene hydroperoxide (CuOOH) was the "active oxygen" donor to apparently homogeneous cytochrome P-450 purified from phenobarbital-pretreated rat liver microsomes. The metabolizing activity of a reconstituted system consisting of the same preparation of cytochrome P-450, NADPH-cytochrome c reductase, and appropriate cofactors was compared to that of the CuOOH system. The CuOOH system metabolized parathion to paraoxon, diethyl phosphorothioic acid, and diethyl phosphoric acid at rates similar to those seen with the reconstituted system. However, the *K*m values for parathion for the formation of these metabolites (50 μM) was larger than the 5 μM seen with the reconstituted system. The amount of sulfur atom bound to cytochrome P-450 was similar using both systems.

76-3055. Beatty, P.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Evidence for a role for DT-diaphorase induction in the toxicity of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD).** *Pharmacologist* 18(2): 211; 1976.

The effect of DT-diaphorase induction on the toxicity of TCDD was studied. An LD50 dose of TCDD (60 μg/kg) given to male rats caused rapid and prolonged induction of hepatic DT-diaphorase activity with levels increased as much as 25-fold those in controls. An LD50 dose of TCDD in female rats (25 μg/kg) caused an almost equal induction of hepatic DT-diaphorase activity to that seen in the males. When the male rats were pretreated with phenobarbital (0.1% in drinking water), the LD50 of TCDD was increased from 25 μg/kg to 45 μg/kg. Pretreatment with phenobarbital in weanling rats halved the induction of DT-diaphorase by TCDD at 2 days post-injection. In cases where phenobarbital treatment was continued after TCDD was given, DT-diaphorase activity was twice that of the TCDD controls, i.e. those not receiving phenobarbital, at 2 days after injection. In these latter animals a markedly greater mortality was noted than in those receiving only TCDD. Octachlorodibenzo-*p*-dioxin caused less than a 2-fold induction of DT-diaphorase after an ip dose of 1 mg/kg. These findings support a relation between DT-diaphorase induction and TCDD toxicity in the rat.

76-3056. Schein, L. G.; Thomas, J. A.; Donovan, M. P.; Klase, P. A. (West Virginia Univ. Med. Cent., Morgantown, WV 26506). **Effects of diazinon, parathion, and carbofuran on the in vitro metabolism of ^{3}H-testosterone by rodent prostate glands and hepatic microsomal enzymes.** *Pharmacologist* 18(2): 243; 1976.

The interference of parathion, diazinon, and carbofuran with testosterone metabolism by target tissues was studied. Prostate glands from rats and mice and hepatic microsomal enzymes were incubated in vitro with excess ^{3}H-testosterone for various times at pesticide concentrations of 0, 0.01, 1, and 100 μM. Parathion was the most potent in interfering with ^{3}H-dihydrotestosterone production by the prostate gland of both animal species. Parathion and diazinon both decreased the formation of ^{3}H-hydroxytestosterone metabolites of testosterone by the hepatic microsomal enzymes of both species. Carbofuran had a stimulatory effect on the formation of these metabolites at short periods of incubation, such as 5 min.

76-3057. Maling, H. M.; Saul, W.; Williams, M. A.; Brown, E. A.; Gillette, J. P. (NIH, Bethesda, MD 20014). **The relation of the potentiation of paraquat 48-hr mortality in rats and mice by 1-isoproterenol to its effects on renal clearance of paraquat.** *Pharmacologist* 18(2): 244; 1976.

The potentiating effect of 1-isoproterenol on paraquat mortality was studied in mice and rats. In rats the 48 hr mortality from i.p. administered paraquat was increased by s.c. injection of either 1-isoproterenol, salbutamol, carbuterol, or fenoterol. When the animals were pre-treated with *dl*-propranolol, *l*-propranolol, or bunolol, the isoproterenol-induced potentiation of paraquat toxicity was completely blocked. Similar effects were not observed using other β-blocking agents or *d*-propranolol. No relation was noted between the effect of a drug on paraquat mortality in rats and its effects on paraquat uptake by lung slices *in vitro*. ^{14}C-labeled paraquat, *N*-methylnicotinamide or *p*-aminohippuric acid was injected into the tail vein of rats and the plasma disappearance of radioactivity was followed. Isoproterenol (0.3 mg/kg, injected s.c. at the same time as the labeled paraquat) reduced the clearance of both the basic and acidic compounds. Therefore, it must have reduced the renal blood flow. This reduced clearance was perhaps the major cause of the increased toxicity of paraquat.

76-3058. DeVore, D. P.; Sheridan, M. A.; Pitman, J. S.; Hutson, T. B. (Battelle, Columbus Labs., Columbus, OH 43201). **Aldrin toxicity in mammalian cells.** *Pharmacologist* 18(2): 245; 1976.

Pesticide toxicity was measured using suspension cultures of HeLa cells. The time course of ^{14}C-aldrin binding to HeLa cells was studied at a single concentration and as a function of filtrate dose as reflected by changes in protein synthesis. Aldrin binding peaked in 15 min, about 5 min later than complete inhibition of amino acid uptake. The binding was dose dependent over a range of 0 to 400 μg/ml. At 302 μg of aldrin, 30.2 μg was bound to 2 x 10^6 cells. Below 50 μg/ml, little or no effect on amino acid incorporation was noted. By determining the effect of aldrin on ATP and cyclic AMP levels in exposed cells, preliminary studies were carried out to examine mechanisms of pesticide toxicity. Results thus far provide basic information required for developing an accurate, predictive cell culture screen for pesticides.

76-3059. Sweeney, G. D.; Jones, K. G. (McMaster Univ., Hamilton, Ontario, Canada). **Hexachlorobenzene (HCB) porphyria in rats: difference between sexes.** *Pharmacologist* 18(2): 245; 1976.

The occurrence of porphyria in rats fed HCB was studied with emphasis on any differences between sexes in the incidence of porphyria. HCB (0.25% practical grade) was added to the diet of female, castrated male, and male Wistar rats. After 5, 7, and 10 weeks porphyria was noted in these respective groups. In females, 20% of the porphyrin was excreted as porphyrinogen; in males, 35-40%. Cytochrome P-450 was highest in the male group, intermediate in the castrated, and lowest in the females. Ethyl isocyanide binding spectra with microsomes from the three groups at pH 7.4 were similar. A decreased induction of drug metabolizing enzyme systems is associated with the increased susceptibility of female rats to porphyria. Intact testes offer some protection.

76-3060. Donovan, M. P.; Thomas, J. A.; Schein, L. G.; Klase, P. A. (West Virginia Univ. Med. Cent., Morgantown, WV 26506). **Perturbation by organochlorine pesticides of ^{3}H-testosterone metabolism in rodent hepatic microsomes and prostate gland in vitro.** *Pharmacologist* 18(2): 245; 1976.

The effect of organochlorine pesticides on dihydrotestosterone formation from testosterone by the rodent prostate gland was studied in vitro. Of the pesticides studied, heptachlor was the most potent, inhibiting ^{3}H-dihydrotestosterone formation in rat tissues at 100 μM and in mouse tissue at 1 μM. At 100 μM chlordane inhibited ^{3}H-dihydrotestosterone formation in mouse, but not in rat tissue. Tissue from either species was refractory to methoxychlor. ^{3}H-Hydroxytestosterone isomer formation was reduced in both mouse and rat hepatic microsomes by all three compounds at 100 μM concentrations. Heptachlor inhibited mouse enzymes at 1 μM and 0.01 μM. These organochlorines interacted with cytochrome P-450 to produce Type I spectral changes in mouse liver microsomes. The presence of more than one type of binding site was indicated by spectral titrations.

76-3061. Yang, K. H.; Peterson, R. E. (Sch. Pharm., Univ. Wisconsin, Madison, WI 53706). **Effect of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) on plasma disappearance and biliary excretion of ouabain in rats.** *Pharmacologist* 18(2): 246; 1976.

The effect of TCDD on ouabain metabolism was studied in male rats. TCDD was given to rats (280-320 g) at 10 or 25 μg/kg, p.o. The femoral vein, artery, and common bile duct were cannulated, and ^{3}H-ouabain (0.5 mg/kg) was given i.v. at 2, 10, 20, and 40 days after TCDD treatment. A decrease in the plasma disappearance and biliary excretion of ouabain was noted at both dose levels of TCDD. These findings were detectable at 2 days after TCDD dosing, peaked between 10 and 20 days for both dose levels, and underwent a slight recovery at 40 days. The extent of the depression was dose related. Sixty-three percent of the ouabain dose was excreted by controls in bile in 1 hr, whereas 2, 10, 20, and 40 days after TCDD treatment biliary recoveries of ouabain were (for the 10 μg/kg group) 57, 42, 44, and 50%, respectively, and (for the 25 μg/kg group) 60, 22, 22, and 37%, respectively. The amount of TCDD in the liver was higher in rats given TCDD. Doses near the LD50 for the male rat produce a long-lasting depression of hepatic excretion of ouabain.

76-3062. Nelson, J. A.; Struck, P. F.; James, R. (Kettering-Mayer Lab., Southern Res. Inst., Birmingham, AL 35205). **Estrogenically-active forms of *o,p'*-DDT and methoxychlor.** *Pharmacologist* 18(2): 247; 1976.

Metabolically active forms of environmental estrogens were studied. The metabolism of *o,p'*-DDT and methoxychlor, both estrogenic in the rat, were studied. The inhibition of (^{3}H)-estradiol binding to the rat uterine receptor by methoxychlor in vitro was enhanced by preincubation with liver microsomes in the presence of TPNH. This treatment leads to the formation of *O*-demethylated products which are major metabolites of methoxychlor in mice and rats. Pretreating immature rats with carbon tetrachloride or SKF-525A increased the uterotopic response to *o,p'*-DDT; phenobarbital pretreatment reduced the response. At 10 ppm, *o,p'*-DDT was neither estrogenic nor antiestrogenic. However, *o,p'*-DDT at 50 ppm inhibited nuclear binding of (^{3}H)-estradiol to incubated whole uteri. The findings suggest that more active forms of methoxychlor are produced during metabolism, whereas *o,p'*-DDT is active as it is.

76-3063. Abou-Donia, M. B.; Charles, J. M.; Menzel, D. B. (Dep. Physiol., Duke Univ. Med. Cent., Durham, NC 27710). **Uptake and metabolism of pesticides by the isolated perfused rat lung.** *Pharmacologist* 18(2): 247; 1976.

Uptake and metabolism of C-14 labeled pesticides, DDT, leptophos, paraquat dichloride, and diquat dibromide, were studied in the isolated perfused rat lung. Absorption from the airway into the vasculature was inversely dependent on the lipid solubility of the compound. DDT and leptophos absorption were therefore much less than paraquat and diquat absorption. Metabolic products of DDT and leptophos were tentatively identified by thin-layer autoradiography and confirmed by gas liquid chromatography and mass spectrometry. The isolated perfused rat lung was perfused with Tyrode's solution containing blue dextran to study the uptake from the vasculature into the airways. Uptake of paraquat and diquat was thus observed.

76-3064. Goto, M.; Mochizuki, Y.; Furukawa, K.; Tsukada, H. (Div. Pathol., Cancer Inst., Sapporo Med. Coll., Sapporo, Hokkaido, Japan). [**Involvement of peroxisomes in the liver carcinogenesis process in mice administered alpha-benzene hexachloride.**] *Proc. Annu. Meet. Jpn. Cancer Assoc.* 35: (Carcinogenesis) 19; 1976. (Japanese)

Decreases have been recorded in the induction of peroxisome formation in precancerous cells and lack of induction in hepatoma cells in rats given 2-FAA or 2'-methyl-DAB. Male dd mice were fed diet containing 500 ppm of α-BHC to observe morphological and histochemical changes in liver carcinogenesis and to examine the inducibility of peroxisome formation by CPIB. Megalocytosis occurred after α-BHC, due to a conspicuous increase in smooth endoplasmic reticulum with peroxisome aggregation on the cellular periphery. After continued administration of α-BHC for 20 weeks, type A nodules appeared in the field of megalocytosis without changes in number and structure of peroxisomes in the cells constituting the nodules. However, the induction level was reduced notably. In small groups of basophilic and highly proliferating cells in type A nodules the inducibility of peroxisomes was strongly reduced. These findings suggest the importance of changes in the inducibility of peroxisome formation as an indication of the precancerous state in the case of α-BHC administration to mice.

76-3065. Kakuto, K.; Hanada, M. (Sch. Pathol., Fac. Med., Osaka Univ., Osaka, Japan). [**Development of hepatic tumors in mice administered benzene hexachloride and their involution: electron microsocpic examination.**] *Proc. Annu. Meet. Jpn. Cancer Assoc.* 35: (Carcinogenesis) 44; 1976. (Japanese)

Groups of mice were fed a daily diet containing 600 ppm of α-BHC for 1, 3, or 5 months; a group was fed the same diet for 5 months and then the basic diet for 3 months. The animals were then sacrificed and their livers were examined electron microscopically. The livers of mice given α-BHC for 1 and 3 months showed swelling microscopically, and those treated for 5 months showed distinct nodes. All of them showed conspicuous proliferation of endoplasmic reticulum, partly arranged in a vortex, with the degree of proliferation increasing with advancing months of administration. The nodular part was larger than the non-nodular part in those treated for 5 months. In the livers of the animals fed for 5 months with the α-BHC containing diet, and then fed with basic diet, no swelling was recognized, and deposition of brownish black lipofuscin was seen instead. Electron microscopically the lipofuscin-deposited part was poor in glycogen granules and endoplasmic reticulum, and there were many lipofuscin granules with centers of high electron density having crystalline structure. These parts of the liver were presumed to be biologically in an inactive state.

76-3066. Hananouchi, M.; Miyata, S.; Tsuda, Y.; Shirai, T.; Kinoshita, T.; Ito, N. (First Sch. Pathol., Nagoya Municipal Univ., Nagoya, Aichi, Japan). [**Studies of protease inhibiting agents on the tumorigenesis and development of liver tumors in mice due to α-BHC.**] *Proc. Annu. Meet. Jpn. Cancer Assoc.* 35: (Prolif.) 1976. (Japanese)

The effects of protease-inhibiting agents were studied on the occurrence and development of mouse liver tumors due to α-BHC. After administering 500 ppm of α-BHC in the diet to male ddy mice for 24 weeks, the protease inhibitors pepstatin, leupeptin, and antipain were given orally at 1000 ppm each in the daily diet for 12 weeks. In place of the administration of a protease inhibiting agent, partial liver excision, extirpation of spleen, or administration of NBU were also carried out on other groups of mice. According to the observations recorded for 12 weeks, the following results were obtained: tumorigenesis

was found in 7.7%, 8.3%, 41.7%, 13.3%, 15.0%, 25.0%, and 25.0% of the mice in groups respectively given only α-BHC, those given also pepstatin, leupeptin and antipain, respectively, and those also subjected to partial liver excision, spleen extirpation, and NBU administration. No clear difference in the histological pictures of liver tumors was found between these groups, and no tumors were found in controls. These findings produced the conclusion that no definite effect of the protease-inhibiting agents in preventing the development of liver tumors due to α-BHC was evident, nor was any effect of partial liver excision, spleen extirpation, or administration of NBU.

76-3067. Kobayashi, H.; Yuyama, A.; Matsuzaka, N. (Author address not given). [**Inhibition of rat brain cholinesterase activity by dichlorvos.**] *Proc. Annu. Meet. Jpn. Soc. Vet. Sci.* 81: 66; 1976. (Japanese)

After subcutaneous administration of dichlorvos to female Wistar rats once a day for 9 successive days at the rate of 1 mg/kg/day, rats were sacrificed at intervals and the cholinesterase activity in the brain homogenates was determined. With reference to the values in rats given only the solvent which had been used for injecting dichlorvos, the ChE activity in dichlorvos-treated animals was 58% after one day; it was about 70% after two to ten days, and had returned to 86% after 20 days, suggesting that complete recovery would take considerably longer. When dichlorvos was added to the brain homogenate and held at 0°C, the degree of inhibition of cholinesterase activity increased until the third day, then remained constant. No change in blood cholinesterase was found when dichlorvos was added to rat's blood. After subcutaneously injecting dichlorvos to rats at 2 mg/kg, collecting the brain and blood after 20 min, and keeping the blood and homogenized brain at 0°C, the cholinesterase activities in brain and blood were found at 60% and 70% of the levels in controls, respectively, and they showed no change with time.

76-3068. Sekiguchi, F.; Kato, M.; Yamada, A.; Morita, Y.; Oshima, Y.; Kitamura, S.; Iwata, H. (Res. Lab. Daiichi Pharm. Co., Ltd., Japan). [**Effects exerted on rats over 6 months by organochlorine pesticides fed in the daily diet.**] *Proc. Annu. Meet. Jpn. Soc. Vet. Sci.* 86: 69; 1976. (Japanese)

Four groups of four-week-old F2 rats bred from SD-JCL rats were resepctively fed with the following daily diets: (1) diets naturally containing pesticides; (2) diets artificially containing a very minute amount of a mixture of α-, β- and γ-BHC, DDT, and dieldrin; (3) diets containing the mixture at 0.02 ppm; and (4) diets containing the mixture at 20.0 ppm for 6 months. They were sacrificed after 3 and 6 months of feeding and autopsied. Growth inhibition was observed on the fourth group up to 6 months; however, the growth rate normalized thereafter. Pesticide residues in the organs and tissues were highest in peritoneal fat, followed by the liver and kidney. They were higher in females than in males. The accumulation of pesticide residues showed no tendency to increase between 3 months and 6 months, suggesting that equilibrium was reached. A significant increase in blood cholesterol was found in the fourth group after 3 months of pesticide ingestion. However, no change was seen after 6 months' ingestion. Pathohistologically, hyperplasia of centrolobular liver cells was seen in the fourth group after 3 and 6 months of ingestion, without any other conspicuous change in other organs.

76-3069. Borzsonyi, M.; Pinter, A.; Nadasdi, L.; Csik, M. (Dep. Morphol., Nat. Inst. Pub. Health, Budapest, Hungary). **Benzimidazol carbamat pesticidekol in vivo keletkezett *N*-nitroso vegyuletek daganatkelto hatasa egerekre.** [**The carcinogenic effects of *N*-nitroso compounds produced in vivo in mice from benzimidazole carbamate-containing pesticides.**] *Magy. Onkol.* 20(2): 89-93; 1976. (26 references) (Hungarian)

The possible carcinogenic effect of *N*-nitroso compounds formed in vivo from the benzimidazole carbamate-containing pesticides benomyl (Benlate) and carbendazim (MBC) was studied. Five to six-week-old Swiss strain mice were given 5% of LD50 (500 mg/kg) of benomyl or MBC twice weekly through a gastric catheter, and were also provided ad lib with drinking water containing sodium nitrite at 500 mg/l. The control groups received the pesticides or sodium nitrite only, or neither. The animals were sacrificed after 30-350 days. Lymphosarcoma was found in 7/20 females and in 0/20 males treated with benomyl and sodium nitrite and in 8/20 females and 2/10 males treated with MBC and sodium nitrite, while neither lymphosarcomas nor other tumors were found in the animals sacrificed within 180 days of treatment with benomyl tap water, MBC + tap water, or sodium nitrite alone. Spontaneous tumors (adenoma of the kidney, breast cancer, lung adenoma, and thymoma) were found in 4/80 females treated with tap water only for 60-350 days. Rapid nitrosation of intragastrically administered benomyl was demonstrated in vitro. The findings indicate the possibility of the formation of carcinogenic *N*-nitroso compounds in the stomach in vivo in the presence of nitrites.

76-3070. Saxena, S. C.; Karek, A. K. (Toxicol. Lab., Dep. Zool., Univ. Rajasthan, Jaipur, India). **A note on the effect of pyrethrum on haemoglobin concentration of Indian desert gerbils, *Meriones hurrianae*.** *Pyrethrum Post* 12(4): 161-162; 1974. (4 references)

The effect of pyrethrum on hemoglobin concentration was studied in Indian desert gerbils, *Meriones hurrianae*. Pyrethrum extract was diluted to prepare solutions of 1.0, 2.0, 3.0, and 4.0% pyrethrins, which were injected i.m. in the thigh of gerbils. Animals were autopsied after 24 hr, 2, 3, 7, 14, 21, and 28 days. A fall in hemoglobin concentration was noted immediately after treatment in both controls and test animals, but the decrease was greater with increased pyrethrin content and was more severe in males than in females. Hemoglobin concentration re-

turned to normal after 14 to 21 days. No appreciable change in red blood cell counts was noted, making an increase in the rate of hemoglobin destruction unlikely. Thus the action of the solvent and of pyrethrin constitutes an effect on hemoglobin synthesis. As there is no evidence of a decrease in the availability of iron, it is suggested that the treatments applied may reduce or prevent the absorption of iron by the polychromatic normoblasts and later stages of erythropoiesis.

76-3071. Rickett, R. E.; Tyszkiewicz, K. (Wellcome Res. Lab., Berkhamsted, Herts., England). **Pyrethrum dermatitis. II. The allergenicity of pyrethrum oleoresin and its cross-reactions with the saline extract of pyrethrum flowers.** *Pyrethrum Post* 12(4): 163-170; 1974. (27 references)

The allergens in crude pyrethrum oleoresin were characterized, and the cross reactions between allergens in this and other extracts of pyrethrum flowers were studied. Two types of allergens were noted in experiments performed on sensitized guinea pigs. The more potent types are compounds with similar allergenic determinants to the allergens present in the 0.9% saline extract of pyrethrum flowers, which have been tentatively classified as glycoproteins or glycopeptides, having molecular weights distributed between 60,000 and 200,000. The other class of allergens is the sesquiterpene lactones, primarily pyrethrosin, but these are of minor importance only, due to their low concentration in pyrethrum oleoresin. No allergenic activity was obtained from pyrethrin II. The results of this study suggest that a small quantity of high molecular weight material is being carried into pyrethrum oleoresin by the large number of other plant extractives, and that this is one of the major causes of allergenicity in crude pyrethrum extracts.

76-3072. Tamiya, K.; Yasuda, Y.; Miyata, M.; Ishikawa, S. (Sch. Ophthalmol., Fac. Med., Kitasato Univ., Sagamihara, Kanawaga, Japan). [**Ocular findings on Wistar rats orally administered carbaryl over a long term, a model experiment on rubeosis iridis.**] *Rinsho Ganka (Jpn. Clin. Ophthalmol.)* 30(7): 777-785; 1976. (16 references) (Japanese)

Long term p.o. administration of an anticholinesterase agent, carbaryl, to groups of Wistar rats (33 animals) caused an intraocular vascular abnormality. Following this the blood vessels of iris, retina, and choroid were studied clinically. The dose rates were 1.5, 3, and 6 mg/rat (b.w. of 210-215 g) each for 20-24 weeks (1/80, 1/40 and 1/20 of the LD50 for a 200 g rat, i.e., for this initial body). The body weight increase was clearly inhibited by carbaryl administration as the dose rate increased. Distinct dilatation of the iris blood vessels was observed in treated rats, the degree being most obvious in the group given 3 mg/rat/week. This appeared to indicate the existence of an optimum dosage. The vascular system in the fundus was observed to contract at first and then go into dilatation, although not so conspicuous as in the iris. If the term "rubeosis iridis" is applied to the iris with noninflammatory vascular proliferation which occurs in diabetes of long standing, the above findings may aid in the study of rubeosis iridis, providing a usable artificial model.

76-3073. Fukami, Y. (Sch. Ophthalmol., Fac. Med., Toho Univ., Tokyo, Japan). [**Ocular injuries to rats in experimental intoxication by an organophosphorus pesticide, fenitrothion.**] *Rinsho Ganka (Jpn. J. Clin. Ophthalmol.)* 30(7): 841-848; 1976. (7 references) (Japanese)

Fenitrothion was administered p.o. to young Wistar rats, weighing 90 g, at 150 and 300 ppm in powdered feed respectively for 13 and 16 weeks. Gross examination for general and ocular symptoms was carried out during feeding and after ending the experiment. The animals' eyes were removed; the cornea was examined histologically and electron microscopically. Both groups of rats (8 and 16) showed ocular and systemic symptoms of intoxication, consisting of hyperemia and edema of the eyelids, corneal infiltration or erosion, impaired rate of increase of body weight, and reduction of serum cholinesterase activity. However, the degree of symptoms in the 150 ppm group was very slight compared to that in the 300 ppm group. Thus it was concluded that the level of 150 ppm of fenitrothion was the minimum effective dose rate for developing symptoms.

76-3074. Moroi, K.; Kuga, T. (Dep. Pharmacol., Inst. Biol. Activ., Chiba Univ., Chiba, Japan). [**Enzyme induction by continued administration of 2-chloro-1- (2,4,5-trichlorophenyl)vinyl dimethyl phosphate, a pesticide.**] *Nippon Yakurigaku Zasshi (Folia Pharmacol. Jpn.)* 72(4): 69; 1976. (Japanese)

Conspicuous induction of drug-metabolizing enzyme systems was produced by continued administration of chlorfenvinphos. The pesticide was administered to male Wistar rats at rates of 60 and 250 mg/kg for ten consecutive days. Although the ChE activity declined until the third day, the inhibitory action of the organophosphate showed no increase in spite of continued administration. Drug-metabolizing enzyme systems were induced beginning on the third day, reaching a maximum on the 7th day, then showing a reduction. In animals pretreated with phenobarbital to increase drug-metabolizing enzyme activity, the ChE inhibitory effect of the phosphate was conspicuously reduced. Demethylation of the phosphate was catalyzed mainly by glutathione-dependent transferases in the supernatant of liver homogenate and only to a small extent by drug-metabolizing enzymes. In rats pretreated with phenobarbital or the phosphate, the metabolism of the phosphate was markedly increased, amounting to 1.2 times that of controls with the supernatant and 6.5 times with liver microsomes. These facts indicate that the continued administration of the phosphate induces the activity of liver microsomal drug-metabolizing enzyme systems and transferases in the supernatant and

accelerates phosphate metabolism, resulting in a lowering of the toxicity of the phosphate.

76-3075. Senczuk, W.; Mlynarczyk, W.; Wozniak, D. (Dep. Chem. Toxicol., Inst. Chem. Anal., Acad. Med., Poznan, Poland). **Zmiany ilosciowe tyrozyny w eksperymentalnych zatruciach ferbamem 76. Cz 1. Zawartosc wolnej tyrozyny w osoczu krwi zwierzat doswiadczalnych.** [**Quantitative determinations of tyrosine in experimental poisoning with ferbam 76. Part 1. Plasma free tyrosine levels in experimental animals.**] *Rocz. Panstw. Zakl. Hig.* 27(2): 197-208; 1976. (9 references) (Polish)

Plasma concentrations of tyrosine were determined in rats after one intragastric administration of various doses of Ferbam 76. This fungicide contains 76% iron *N,N*-dimethyldithiocarbamate. A rectilinear correlation was noted between the dose of Ferbam 76 and the plasma level of tyrosine at 12 hr after administration of the preparation. When subacute poisoning levels were investigated, a steady rise of plasma tyrosine level was noted.

76-3076. Sitkiewicz, D.; Konecka, A. M.; Chojnacka-Baldys, K.; Czerska-Trzcinska, A. (Sec. Metab. Dis., Inst. Biofarm. Akad. Med., Warsaw, Poland). **Wplw insektycydow fosforoorganicznych na aktywnosc oksydazy cytochromowej i dehydrogenazy bursztynianowej mozgu szczura i kury.** [**The effect of organophosphate insecticides on the cytochrome oxidase and succinate dehydrogenase activity of rat and hen brain.**] *Rocz. Panstw. Zakl. Hig.* 27(3): 277-286; 1976. (14 references) (Polish)

Dipterex (trichlorfon) and DDVP (dichlorvos) effects were studied on the cytochrome oxidase and succinate dehydrogenase activity of rat and hen brain mitochondrial fractions. Cytochrome oxidase activity was inhibited after preincubation of solubilized mitochondrial fractions with dipterex. Maximum inhibition of this enzyme activity was achieved in the brain of both rats and hens after 15 min of preincubation. Increasing the preincubation time to 45 min did not change the percent of inhibition. DDVP stimulated cytochrome oxidase activity in rat and hen brain without preincubation. After preincubation periods of 15, 30, and 45 min, the activity of cytochrome oxidase decreased to control levels. Neither dipterex nor DDVP affected succinate dehydrogenase activity of rat or hen brain under these experimental conditions.

76-3077. Rozycka, D. (Inst. Forensic Med., Krakow, Poland). **Badania nad toksycznoscia octanu fenylorteciowego. Czesc I. Wplyw octanu fenylorteciowego na retencje rteci w niektorych narzadach kurczat.** [**Studies on the toxicity of phenylmercuric acetate (PMA) in chickens. 1. The effects of administration of PMA on mercury retention in some organs of chickens.**] *Rocz. Panstw. Zakl. Hig.* 27(3): 287-293; 1976. (21 references) (Polish)

Mercury accumulation and retention were studied in liver, kidney, brain, and muscle of chickens. The chickens received either 1 mg/kg or 10 mg/kg of PMA every 48 hr during periods of 8, 16, 24, 32, or 40 days. Mercury concentration in the liver and kidney increased in a regular manner over the 40 day test period, and the amount accumulated was directly proportional to the dose given. In muscle tissue an equilibrium was reached after 16 days. Only slight uptake of mercury was noted in the brain. Mercury retention given as a percentage of total dose administered was 0.6% in both the liver and kidney and was not dependent on the amount of PMA administered. No sex differences were noted concerning accumulation or retention of mercury. Body weight gain showed no differences between treated and control chickens. Mercury intoxication was not noted.

76-3078. Oshima, H.; Imai, M. (Inst. Ind. Med., Fac. Med., Mie Prefect. Univ., Yokkaichi, Mie, Japan). [**On the mammalian toxicity of a phenoxyacetic acid type herbicide. Part 2. Subacute toxicity of 2-methyl-4-chlorophenoxy acetanilide.**] *Sangyo Igaku (Jpn. J. Ind. Health)* 18(1): 51; 1976. (Japanese)

Wistar rats of both sexes and ICR mice were fed diet containing 0, 40, 120, 360, 1080, or 3240 ppm of 2-methyl-4- chlorophenoxy acetanilide (MCPA) daily for 3 months. Five animals from each group were sacrificed one month after the beginning of feeding and autopsied. The major findings in rats which were attributed to the herbicide were reduced RBC and hemoglobin, increases of reticulocytes and serum γ-globulin, increase in weight of the liver and kidney, hypertophy and darkening of the spleen, congestion and deposition of hemosiderin in the liver, and deposition of hemosiderin in the spleen in groups given more than 120 ppm. Weight increase of the spleen, increases in normoblasts, and deposition of hemosiderin in bone marrow were seen in groups given more than 360 ppm. Delayed body weight gain, increase in the incidence of urinary urobilinogen, and blackening and deposition of hemosiderin in the kidney were seen in groups given more than 1080 ppm. Increases in the incidence of urinary coproporphyrin were seen in the group given 3240 ppm. From these findings, the maximum no-effect level of the herbicide in the rat was concluded to be 40 ppm, i.e., 2.81-3.35 mg/kg/day. The findings on mice which were attributed to the herbicide were similar to those in the case of rats, but started at different levels. The maximum no-effect level of the herbicide was also thought to be 40 ppm, that is, 5.99-6.7 mg/kg/day.

76-3079. Shindo, N. (Fac. Agric., Meiji Univ., Kawasaki, Kanagawa, Japan). [**Dynamics of organosulfur fungicides in the environment.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 307-311; 1976. (49 references) (Japanese)

Organosulfur fungicides can be divided into two major classes, dimethyldithiocarbamates such as ferbam and ziram and their oxidation products such as TMTD, and ethylenebisdithiocarbamates such as nabam, zineb, maneb, mancozeb, and propineb. Thyreophymas may be

induced by nabam, zineb, and ethylenethiourea (the latter formed by degradation of nabam in water). The degradation and formation of ethylenethiourea from ethylenebisdithiocarbamates were described in detail. The metabolism of organosulfur pesticides in plants and degradation of these and of ethylenethiourea in soil were described. Also, the fate of such compounds in animals was described, especially in connection with their toxicity. Finally, the toxicity of ethylenethiourea was again stressed, citing the temporary ADI of 0.005 mg/kg recently established by WHO.

76-3080. Fujiya, K. (Freshwater Regional Res. Lab., Fish. Agency, Tokyo, Japan). [**Dynamics of pesticides in aquatic systems and their absorption and fate in fish.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 325-328; 1976. (Japanese)

Pesticide problems in fisheries, especially in artificial fish cultures, were described in relation to the dynamics of pesticides introduced into aquatic systems. The problems consist of malformations due to pesticide-contaminated feed, and poor growth due to absorption and accumulation of traces of pesticides present in waters, resulting in poorer cultured fish yields. Introduction of pesticides into aquatic systems occurs from pesticide drift and runoff from pesticide-treated plants and soil. Some pesticides are apt to be absorbed and accumulated into fish through the food chain and from water containing tracs of pesticides. Such a phenomenon was explained, based on the case of dieldrin.

76-3081. Kazano, H.; Tomizawa, C. (Nat. Inst. Agric. Sci., Min. Agric. For., Tokyo, Japan). [**Utilization of a model ecosystem as a method for predicting the biological concentration of pesticides.**] *Shokubutsu Boeki (Plant Protect.)* 30(8): 329-335; 1976. (29 references) (Japanese)

The model ecosystem devised by Metcalf et al. was described, and some of the results obtained on the biological accumulation of DDT and its non-biologically accumulating derivatives were presented. Results obtained with the original system are discussed along with improvements made by the authors on this system and on Kearney's aquatic microecosystem. The authors' model ecosystem consisted of water, silica sand, planted leaves of sweet potato, larvae of *Spodoptera littoralis*, red snails, *Ceratophyllum demersum*, mosquito larvae, and *Lebistes reticulatus* contained in a glass box (60x30x35 cm). The major results of the authors' experiments in the ecosystem dealt with the difficult to decompose isomer ^{14}C β-BHC as well as its accumulation, accumulation of the labeled metabolite of ethylthiometon, the fate of 3,5-xylyl *N*-methylcarbamate (maqbarl), and the degradation of ^{35}S-*O*-ethyl *S*,*S*-diphenyldithiophosphate, forming diphenyldisulfide and then sulfuric acid. Future improvements may lead to still more realistic model ecosystems.

76-3082. Ecobichon, D. J.; Johnstone, G. J. (Dep. Pharmacol., Dalhousie Univ., Halifax, Nova Scotia, Canada). **The influence of pure polychlorinated biphenyl compounds on hepatic function in the rat.** *Toxicol. Appl. Pharmacol.* 25(3): 440-441; 1973.

The highly heterogeneous commercial polychlorinated biphenyls (PCBs) have been reported to alter mammalian hepatic function. Are the effects due to the biphenyl nucleus, the number of chlorine groups per molecule, or the position of the chlorine groups on the ring structures? To answer these questions, pure biphenyl and isomerically pure mono-, di, tetra-, hexa, octa- and decachloro biphenyls with known chemical composition were injected ip (50 mg/kg/day) into young male Wistar rats (50-60 g) for 3 days; the animals were killed 96 hr after the last injection. The potency of the pure PCB's was compared to that of *o,p'*- and *p,p'*-DDT and commercial Aroclors (1254, 1260) administered at the same concentrations. Hepatic function was assessed by pentobarbital sleeping times and in vitro assays of hepatic microsomal *O*-demethylase, *N*-demethylase, aniline hydroxylase, nitro-reductase, and carboxylesterase activities and the cytoplasmic bromosulfophthalein (BSP)-glutathione conjugating enzyme system. The biphenyl nucleus played little role, since biphenyl caused no induction of hepatic drug-metabolizing enzymes. Monochlorobiphenyl (4-C1) was without influence; of the di- and tetrachlorobiphenyls, substitution of chloro groups at the 3 and 4 positions resulted in enhanced induction of microsomal monooxygenases. The more highly chlorinated hexa- and octa- chlorobiphenyls caused an enhanced induction of monooxygenases, though differing little from one another. Nitro-reductase and carboxylesterase activities were not significantly affected by any of the agents whereas all agents, including biphenyl, caused a marked induction of the BSP-conjugating system. (Author abstract by permission)

76-3083. Rand, H. (Marietta, GA 30060). **Evaluation of ComBot (trichlorfon) when combined with phenothiazine, mebendazole or thiabendazole for use as a broad-spectrum anthelmintic in horses.** *Vet. Med. Sm. Anim. Clin.* 70(11): 1297-1299; 1975. (6 references)

ComBot (trichlorfon) was administered to 316 horses, ponies, and mules of different ages and sexes by stomach tube. The pesticide was given at a rate of 0.5 oz formulation/100 lb body weight and combined with phenothiazine, mebendazole, or thiabendazole just prior to administration. In some cases, the animals were fasted prior to pesticide treatment. Adverse effects were not observed in the non-fasted animals or in 54 of the fasted animals. Side effects in the other animals included watery diarrhea and colic. Large numbers of bots, ascarids, and strongyles were removed in the feces after treatment. ComBot may be safety used at the rate of 0.5 ox/100 lb body weight in combination with therapeutic doses of phenothiazine, mebendazole, or thiabendazole, provided feed is not withheld before treatment.

76-3084. Cole, M. A. (Dep. Agron., Univ. Illinois, Urbana, IL 61801). **Effect of long-term atrazine application on soil microbial activity.** *Weed Sci.* 24(5): 473-476; 1976. (12 references)

Analysis of soil in which corn (*Zea mays* L.) had been grown annually for 9 yr with or without yearly applications of 3.4 kg/ha atrazine [2-chloro- 4-(ethylamino)-6-(isopropylamino)- *s*-triazine] indicated that long-term atrazine use had little effect upon soil microbes or biochemical processes. With the exception of a transient inhibition of bacterial growth during the first week after field application, repeated applications did not affect the numbers of viable bacteria or fungi, relative abundance of bacteria producing hydrolytic enzymes, or soil enzyme levels. (Author abstract by permission)

76-3085. James, M. O.; Bend, J. R. (Pharmacol. Branch, Natl. Inst. Environ. Health Sci., P. O. Box 12233, Research Triangle Park, NC 27709). **Taurine conjugation of 2,4-dichlorophenoxyacetic acid and phenylacetic acid in two marine species.** *Xenobiotica* 6(7) 393-398; 1976. (7 references)

The nature of the metabolites of phenylacetic acid in selected fish was studied and an attempt was made to determine whether 2,4-D is metabolized by the same pathway as phenylacetic acid in marine species. Flounders were injected in the lateral vein with phenylacetic acid, sodium salt solution (50 mg/kg). Dogfish (sharks) were injected in the caudal vein with phenylacetic acid sodium salt solution (50 mg/kg) or a solution of 2,4-D (30 mg/kg). At least 50% of the dose of ^{14}C-labeled 2,4-D or phenylacetic acid was excreted in urine within 48 hr after dosing in the dogfish shark or flounder. More than 90% of the urinary ^{14}C was present as the taurine conjugate of the administered compound. Thus the amino acid used for conjugating 2,4-D in the dogfish shark was the same as that used for phenylacetic acid in both the dogfish shark and flounder.

76-3086. Scheufler, H.; Dedek, W.; Schneider, P. (Biol. Inst. Ber. Med. Martin-Luther-Universitaet Halle-Wittenberg, Halle (Saale), DDR). **Zur Wirkung von Desmethyltrichlorphon und Aethyltrichlorphon in hohen Dosen auf die Keimesentwicklung der Labormaus. [Effect of large doses of demethyltrichlorfon and ethyltrichlorfon on the embryonic development in laboratory mice.]** *Z. Ges. Hyg. Ihre Grenzgeb.* 22(8): 565-569; 1976. (34 references) (German)

The possible embryotoxicity of demethyltrichlorfon and ethyltrichlorfon in mice was studied. Demethyltrichlorfon (given i.p. to pregnant mice at 120 mg/kg or 240 mg/kg over periods of one to two weeks or on individual days of pregnancy) proved to be embryotoxic. The effects are ambiguous in cases of inbred C57B1 and DBA mice. Ethyltrichlorfon, given even in small doses (40 mg/kg), showed both embryotoxic and teratogenic effects. It is concluded that the embryotoxic action of trichlorophon must not be determined solely by its aklylating properties.

76-3087. Engelhardt, G.; Wallnoefer, P. (Bayer. Landesanst. Bodenkult. Pflanzenbau, Munich, Germany). **Hydrolyse von methoxysubstituierten Phenylharnstoffen, Acylaniliden und Phenylcarbamaten durch eine mikrobielle Aryl Acylamidase. [Hydrolysis of methoxy-substituted Phenylureas, acylanilides and phenyl carbamates by a microbial aryl acylamidase.]** *Zentr. Bakteriol. Parasitenk., Infektionskr. Hyg., Abt. I Orig. Reihe B* 162 (1-2): 138-144; 1976. (11 references) (German)

The hydrolysis of methoxy-substituted phenylureas, acylanilides, and phenylcarbamates by a microbial aryl acylamidase was studied. Linuron was hydrolyzed quantitatively by *Bacillus sphaericus* ATCC 12123, forming 3,4-dichloroaniline, carbon dioxide, and *N,O*-dimethylhydroxylamine. Polyacrylamide gel electrophoresis was used to purify the inducible enzyme responsible for the hydrolysis. Its molecular weight was 75,000. Substrate specificity studies showed that whole cells as well as the linuron-induced enzyme hydrolyze a large number of herbicidal and fungicidal acylanilides, the methoxysubstituted phenylureas, and the phenylcarbamate propham at the carbonyl-aniline bond. Thus the enzyme would be classified as an aryl acylamidase. Various methylcarbamate and organophosphorous insecticides inhibit the hydrolysis of phenylamides by whole cells and by the enzyme. The methylcarbamate inhibition of linuron hydrolysis by the aryl acylamidase is competitive.

76-3088. Eberspaechter, J.; Haug, S.; Blobel, F.; Sauber, K. (Inst. Mikrobiol., Univ. Hohenheim, D-7000 Stuttgart 70, Germany). **Der Abbau des Herbizides Pyramin durch Mikroorganismen des Bodens. [Breakdown of the herbicide pyramin by microorganisms of the soil.]** *Zentr. Bakteriol., Parasitenk., Infektionskr. Hyg. Abt. I Orig. Reihe B* 162(1-2): 145-148; 1976. (10 references) (German)

The breakdown of pyrazon, a herbicide contained in Pyramin which is used during the cultivation of beets to combat broad-leaf weeds, in the soil was studied. This substance disappears relatively quickly. The dephenylated heterocycle of pyrazon, 5-amino-4-chloro-3-(2H)pyridazinone, was obtained as the transformation product. Bacteria which grew on pyrazon as sole carbon source were isolated from soil samples originating in different parts of the world. During the cultivation of pyrazon-degrading bacteria in a pyrazon mineral salt medium four compounds were excreted. The structure of these metabolites and information gained from enzymatic tests allowed the presentation of a scheme for the bacterial degradation of pyrazon.

76-3089. Sauber, K.; Blobel, F.; Haug, S.; Eberspaechter, J. (Inst. Mikrobiol. Univ. Hohenheim, D-7000 Stuttgart 70, Germany). **Zur Enzymatik des mikrobiellen**

Pyrazonabbaus. [**On the enzymatics of the microbial breakdown of pyrazon.**] *Zentr. Bakteriol., Parasitenk., Infektionskr. Hyg. Abt. I Orig. Reihe B* 162(1-2): 149-152; 1976. (7 references) (German)

The enzymatic breakdown of pyrazon was studied. Bacteria were isolated from samples of soil taken in different parts of the world. These bacteria were grown on pyrazon as the sole carbon source. When grown in a pyrazon-mineral salt medium, four compounds were excreted by the bacteria into the medium. These compounds gave information concerning the catabolic route of pyrazon. The breakdown scheme resulting from this study was still incomplete and therefore the enzymatic tests were conducted to further clarify the picture. The first steps of breakdown were able to be carried out in a cell-free extract of the pyrazon degrading bacteria. The second step of pyrazon breakdown required two different enzymes of the same catalytic activity. For the oxidative cleavage of the pyrocatechol derivative two different enzymes were noted: an *ortho*- and a *meta*-cleaving enzyme. The 2-hydroxy muconic acid decarboxylase was identified as a further enzyme. The connection of this enzyme with further breakdown is discussed.

76-3090. Bachofer, R. (Inst. Mikrobiol., Univ. Hohenheim, D-7000 Suttgart 70, Germany). **Mikrobieller Abbau von Saeurenanilid-Fungiziden.** [**Microbial breakdown of acid anilide fungicides.**] *Zentr. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. I Orig. Reihe B* 162(1-2): 153-156; 1976. (9 references) (German)

The microbial breakdown of acid anilide fungicides was studied. The fungicides studied included *o*-toluylanilide, 2,5-dimethylfuran-3- carboxanilide, 5,6-dihydro- 2-methyl-1,4- oxathiine-3- carboxanilide, and other acid anilides. These chemicals act selectively on rusts and smuts. A *Nocardia* sp. was isolated from garden soil. This species can grow with acid anilide fungicides as the sole carbon source. Mutants were produced which were blocked at various steps of the breakdown pathway of these acid anilide fungicides. The breakdown pathway could be followed with the aid of accumulates of the rough I strain and of the mutants as well as by growth and enzyme tests. Hydrolytic splitting of the acid amide bond started the breakdown by an acylamidase. Accumulation of the acid components of the fungicides occurs in the medium. These do not affect the growth. The aniline component is oxidized to pyrocatechol by a dioxygenase. Methyl and chloro-derivatives of aniline which are formed in the soil due to the hydrolysis of herbicides and fungicides are also converted to the respective pyrocatechol derivatives. *Ortho*-cleavage of pyrocatechol formed *cis-cis* muconic acid. This compound in turn is metabolized into succinate and acetyl CoA via the β-ketoadipate pathway.

76-3091. Senser, F. (Deutsche Forschungsanst. Lebensmittel-Chem., D-8000 Muenchen 40, Germany). **Beeinflussung der an Ernteguetern (Lebensmittel pflanzlicher Herkunft) vorkommenden Mikroorganismen durch Schaedlingsbekaempfungsmittel.** [**Effects produced by insecticides on microorganisms growing on harvest crops (vegetable foodstuffs.**] *Zentr. Bakteriol., Parasitenk., Infektionskr. Hyg. Abt. I Orig. Reihe B* 162(1-2): 198-200; 1976. (2 references) (German)

The effects of insecticides on microorganisms growing on crops were studied. Microorganisms were isolated from various harvested crops and identified. Their ability to degrade pesticides which are commonly applied over large areas of croplands was investigated. Some types of molds occur regularly on untreated foodstuffs of vegetable origin. These molds have changed in composition and growth density during the last five to ten years. They are now capable of degrading pesticides to only a limited extent. It is suggested that the great increase in *F. oxysporum* on corn and corn flour may be caused by the application of herbicides.

76-3092. Sokkar, S. M.; Mohammed, M. A.; Soliman, F. A. (Dep. Pathol., Vet. Med. Animal Physiol., Fac. Vet. Med., Cairo Univ., Egypt). **Toxic effects of diazinon on the gonads of fowls.** *Zentralbl. Veterinaer-Med.* (A) 22(7): 557-563; 1975. (13 references)

The toxic effects of diazinon on the gonads of fowls were examined in forty Dokki-4 chickens. Twenty-six hens and 5 cocks were dipped in diazinon at a concentration of 1/1000. Chickens which died after dipping showed no gross lesions except for general congestion. Surviving hens during the maintenance time of 4 months laid only 16 eggs in contrast to 456 eggs laid by the controls during the same time. Levels of gonadotrophic, thyrotrophic, and adrenocorticotrophic hormones in the pituitary and serum of the treated hens were significantly lower than in control birds. It is suggested that there is a causal relation between the low levels and the extensive retrogressive changes which were observed grossly and microscopically in the ovaries of the treated hens. No changes were observed in the gonads of cocks treated in a similar manner.

See also **76-2881** **76-2883** **76-2906** **76-2912** **76-2924** **76-2925** **76-2926** **76-2928** **76-2962** **76-2968**

76-3093. Baluja Marcos, G. (Inst. Quim. Organ. C.S.I.C., Madrid, Spain). **Criterios sobre las metodologias del analisis residual.** [**Criteria on the methodologies of residue analysis.**] *Afinidad* 33(333): 47-56; 1976. (Spanish)

The sequence of fundamental operations in the residue analysis of pesticides is presented. Following recommendations for the gathering and preparation of samples, the description of each successive stage emphasizes practical problems and is illustrated by details from original experiments. In terms of the liberation and purification of extracts, a distinction is made between the general types of pesticides. Nonionic compounds (insecticides) derived from chlorine or phosphorus) may be extracted from their substrates with solvents of little or no polarity. Ionizable compounds (herbicides require a polar solvent. Extracts from soils, waters, and organic tissues must undergo purification through adsorption chromatography with Florisil or aluminum oxide. In view of the difficulties of extracting organochlorine residues from oils, it seems that best results are obtained with mixtures of solvents, hexane-dimethylformamide, or hexane-acetonitrile. Gas-liquid chromatography plays the major role in the detection and identification of residues. There is a discussion of the yield of chromatographic columns and the advantages of using columns with mixed phases. The separation of *p,p'*-DDE/dieldrin and *o,p'*-DDT/endrin serves as a practical illustration. In a study of interferences in the detectors because of impurities in the extracts, sulfur and PCBs are noted as the most common offenders.

76-3094. Matas Docampo, R.; Bartual Sanchez, J.; Albesa Vilalta, A. (Dep. Hig. Trabajo, Inst. Territorial de Barcelona, Barcelona, Spain). **Determinacion analitica de pesticidas en aire.** [**Analytical estimation of pesticides in air.**] *Afinidad* 33(333): 57-62; 1976. (19 references) (Spanish)

The importance of analytical methods and techniques are emphasized in the determination of health hazards due to pesticides. Occupational exposure to chemicals is first considered, with recommendations for biological monitoring and a comparison of the threshold limit values and short-term limits allowed in the U.S. and the USSR. In relation to the methodology for the analysis of contaminants in the air, preference is given to the taking of samples in tubes filled with solid absorbent materials such as porous polymers. No single solvent can be used for the extraction of all pesticides. Hexane and dichloromethane have proved successful on glycols used in liquid samplers. In the case of solids, the use of a Soxhlet apparatus and a mixture of hexane-acetone leads to a high yield in the recovery of many pesticides. After concentration, the extracts are separated and cleaned up by chromatography on silica gel. When dealing with pesticides of low volatility (herbicides), it is advisable to prepare derivatives before quantification. Gas chromatography is appraised as one of the few techniques allowing the analysis of residues at very low levels.

76-3095. Iwan, J. (Pflanzenschutzforsch. Anal. Biochem., Schering AG, Berlin/Bergkamen, Germany). **Metodos para elucidar el metabolismo de las pesticidas en las plantas.** [**Methods for elucidating the metabolism of pesticides in plants.**] *Afinidad* 33(333): 85-89; 1976. (9 references) (Spanish)

Methodology used in studying the metabolism of pesticides in plants is reviewed. The radioactive material is first separated from the tested plants through the action of an adequate solvent. Sufficiently hydrophobic compounds may be treated according to the Bligh-Dyer extraction process (2 phases: chloroform + methanol; chloroform + water). As a general illustration for the clean-up stage, a scheme is cited that was devised by Still and Mansager for identifying the metabolites of chlorpropham in alfalfa. Ultimate spectroscopic analysis (mass spectrometry, gas chromatography) offers the key to the metabolism of a pesticide. However, only 20% of organic compounds may be investigated in this way in their original form. In many substances, the metabolic fraction must be isolated by other methods or obtained by derivatization, so as to achieve greater volatility and stability. The identification of bound residues remains a stubborn problem. Propanil residues proved very difficult to liberate from rice through various methods of tissue digestion.

76-3096. Guilbault, G. G.; Iwase, A. (Dep. Chem., Univ. New Orleans, New Orleans, LA 70122). **Assay of cholinesterase in an electrode system with an immobilized substrate.** *Anal. Chim. Acta.* 85: 295-300; 1976. (5 references)

A rapid, simple method for the measurement of cholinesterase is described. The method is based on the use of an immobilized substrate for assay with a hydrogen-ion electrode. Two different reaction cells were used: cell 1 was a self-containing substrate electrode with the immobilized substrate directly on the surface of the glass electrode, kept in place by nylon net in a "basket"; and cell 2 used the immobilized enzyme held in a nylon net "basket" at the bottom of the cell, with the electrode free to measure H+ ions. The enzymatic reaction yielded a linear change of pH with time, and the reaction rate was constant over a pH range of 7.8-8.3. The reaction rate decreased as the NaCl and Tris buffer concentrations increased. Each assay required only 3 min and the immobilized substrate could be used for 10 assays with cell 2; with cell 1, the substrate layer had to be renewed after each run. The precision obtained (2.5%) was the same as that possible with the soluble substrate system.

76-3097. Rajak, R. L.; Krishnamurthy, K. (Indian Grain Storage Inst., Hapur, India). **Studies on the use of dichlorvos for disinfestation of foodgrains etc. Part II. Analysis of dichlorvos residues in food stuffs.** *Bull. Grain Technol.* 12(3): 185-195; 1974. (6 references)

A standardized enzymatic method was developed for the analysis of dichlorvos residues in treated raw and processed foods. The extraction and cleanup process in-

volves extraction with methylene chloride or petroleum ether, careful evaporation of the organic phase in the presence of water, partitioning of petroleum ether based fat against water, and cholinesterase assay in the water phase. In commodities containing less than 1% or more than 15% fat, duplicate partitioning steps are desirable. Some foodstuffs (e.g., mustard, til, cumin, and coriander) contain naturally occurring substances which can inhibit human blood plasma cholinesterase, although to only a small extent. Dichlorvos recovery from treated wheat flour was 88-91%, while recovery from processed wheat and rice was only 4.3-9.6%. Recovery from cereals, millets, pulses, oil seeds, spices, dry fruits, and other miscellaneous foods varied from 33.2% (groundnut peeling) to 92.5% (corn flakes).

76-3098. Jenik, M.; Madaric, A.; Gecova, K. (Res. Inst. Hyg., Bratislava, Czechoslovakia). **Stanovenie organofosforovych insekticidov v ovzdusi. [Determination of organophosphorus insecticides in the atmosphere.]** *Cesk. Hyg.* 20(2): 83-89; 1975. (27 references) (Slovak)

Studies on the determination of organophosphorus insecticides in the atmosphere are reviewed. Spectrophotometric methods were described for various compounds, including parathion, phthalophos (phosmet), phosalone, dichlorvos, chlorophos (trichlorfon), demeton-methyl, oxydemeton-methyl, dimethoate, mecarbam, morphothion, demeton, thiometon, prothoate, vamidothion, thionazin, trichlorfon, demephion, butonate, dicofol, methyl parathion, Di-Syston (disulfoton), octamethyl, and phosphamidon. Also described were gas chromatographic techniques for determining Birlane EC 24 (chlorfenvinphos), diazinon, ethion, fenitrothion, and thiometon levels in the atmosphere. In contrast to the spectrophotometric and gas-chromatographic methods, enzymatic methods are able to provide information on both the concentration and toxicity of the studied compound in an atmosphere sample. Tests on percentage inhibition of (horse serum) cholinesterase activity, based on a modification of Giang and Hall's method, are described for Ekatox 20 (thiometon), E 605 (parathion), and Potasan.

76-3099. Schulte, E.; Thier, H.-P.; Acker, L. (Inst. Lebensmittelchem., Univ. Muenster, Muenster, Germany). **Rueckstandsanalytik polychlorierter Biphenyle in Lebensmitteln tierischer Herkunft: Erfahrungen und Vorschlaege zur Vereinheitlichung. [Residue analysis of polychlorinated biphenyls in food of animal origin: experiences and suggestions for standardization.]** *Dtsch. Lebensm. Rundsch.* 72(7): 229-232; 1976. (9 references) (German)

A method described by Stijve for polychlorinated biphenyl (PCB) residue analysis has been shown to be practical for the cleanup of fatty foods of animal origin. The gas chromatographic separation on packed columns should be performed with QF-1 or XE-60 as the stationary phase, since good separation of PCBs from most chlorinated hydrocarbon pesticides can be obtained thus. In most cases fractionation of the purified extracts prior to gas-liquid chromatography can be dispensed with. For a quantitative evaluation of the chromatograms two characteristic peaks still present in the foodstuffs should be selected. Experience gained in such experiments should aid in the standardization of PCB analyses and allow better comparability of results.

76-3100. Kodama, O.; Akatsuka, T. (Author address not given). **[Rapid colorimetric assay for DCPA (propanil) hydrolase.]** *Ibaraki Daigaku Nogakubu Gakujutsu Hokoku (Sci. Rep. Fac. Agric. Ibaraki Univ.)* 22:49-51; 1974. (3 references) (Japanese)

A method for the rapid estimation of DCPA hydrolase activity in rice plants was developed using DCPA as a substrate. A colorimetric reaction using *p*-dimethylaminocinnamaldehyde (*p*-DACA) as a color reagent allowed the determination of 3,4-dichloroaniline (DCA) which was liberated by DCPA hydrolase. A 2.5 ml incubation mixture containing 0.5 ml enzyme solution, 1 ml 0.8 x m*M* DCAP, and 1 ml 01.3 *M* phosphate buffer (pH 7.0) was prepared. After incubation at 37°C for 20 min, 0.5 ml of this mixture was placed in a test tube containing 0.5 ml 0.2 *N* HCl to stop the enzyme reaction. Subsequently 2 ml of 0.1% *p*-DACA solution in ethanol was added to the tube. After 15 min, the color density of azo dye was measured with a photometric colorimeter at 540 nm.

76-3101. Sarna, L. P.; Howe, G. J.; Findlay, G. M.; Webster, G. R. B.* (Pestic. Res. Lab., Dep. Sci., Univ. Manitoba, Winnipeg, Manitoba, Canada). **Quantitative gas chromatographic analysis of dimethoate and several metabolites in rape, quail, and grasshopper tissues by derivatization.** *J. Agric. Food Chem.* 24(5): 1046-1048; 1976. (19 references)

A method for the simultaneous quantitative analysis of the organophosphorus insecticide, dimethoate, and its oxon, acid, and *O*-demethyl metabolites has been developed. Recovery data have been collected using spiked samples of rape, quail, and grasshopper tissues. Analysis of the extracts, without prior cleanup, was conducted after derivatization with diazoethane. Total analysis time for all four compounds in a mixture is approximately 12 min. (Author abstract reprinted by permission of the American Chemical Society)

76-3102. Ivey, M. C.; Oehler, D. D. (Vet. Toxicol. Entomol. Res. Lab., ARS, U. S. Dep. Agric., College Station, TX 77840). **Gas-liquid chromatographic determination of iodofenphos and several related compounds in tissues and urine of cattle.** *J. Agric. Food Chem.* 24(5): 1049-1053; 1976. (5 references)

A gas chromatograph equipped with a flame photometric detector provided a highly sensitive method

for determining residues of iodofenphos (CIBA C-9491) (*O*-(2,5-dichloro- 4-iodophenyl) *O,O*-dimethyl phosphorothioate), its oxygen analogue, deiodinated iodofenphos, the deiodinated oxygen analogue, and ronnel in cattle tissues. Free and conjugated residues of two phenolic metabolites of iodofenphos (2,5-dichlorophenol and 2,5-dichloro- 4-iodophenol) were determined after silylation by gas chromatography with an electron capture detector. With extraction and cleanup, 0.005 ppm of iodofenphos, 0.002 ppm of its photodecomposition product, 0.01 ppm of the oxygen analogue of iodofenphos, 0.004 ppm of its photodecomposition product, 0.003 ppm of ronnel, 0.001 ppm of 2,5-dichlorophenol, and 0.002 ppm of 2,5-dichloro-4-iodophenol could be detected. Recoveries of the five phosphorus compounds were 70-98%. Recoveries of the two phenolic compounds were 50-98%. (Author abstract reprinted by permission of the American Chemical Society)

76-3103. Miller, V. L.; Csonka, E.; Gould, C. J. (Dep. Agric. Chem. Plant Pathol., Washington State Univ., Western Washington Res. Extension Cent., Puyallup, WA 98371). **Estimation of milligram and submilligram amounts of Busan fungicide.** *J. Assoc. Off. Anal. Chem.* 59(4): 737-739; 1976. (7 references)

A procedure is described for the estimation of Busan 72 ((2-thiocyanomethylthio) benzothiazole) in the range of 0.01-1.0 mg/ml. An aqueous suspension of the material is heated with dilute sodium hydroxide, cooled, and treated with copper ion. The insoluble reaction product is filtered, and excess copper is determined by using a pyridine-thiocyanate procedure. Analysis may be completed by either spectrophotometry or comparison with described artificial standards. (Author abstract by permission)

76-3104. Dyer, R. H.; Martin, G. E. (Sci. Serv. Div., Bureau Alcohol, Tobacco and Firearms, Dep. Treasury, Washington, DC 20226). **Collaborative study of the gas-liquid chromatographic determination of coumarin (1,2-benzopyrone) in wine.** *J. Assoc. Off. Anal. Chem.* 59(4): 780-782; 1976. (3 references)

The determination of coumarin in wine by using gas-liquid chromatography of a chloroform extract was collaboratively studied. Eleven collaborators analyzed 6 samples: 3 containing 4.0 mg coumarin/l, 2 containing 8.0, and 1 containing 0.0. When the triplicate and duplicate recoveries for the 4.0 and 8.0 levels were averaged and treated singly for the collaborators, there was no statistically significant difference in the accuracy between the 2 levels. However, the accuracy for the 4.0 level was much better than that for the 8.0 level: 100.0 vs. 105.9%. An analysis of the individual values showed no significant differences among collaborator means at the 4.0 mg/l level, while there was a significant difference among means at the 8.0 mg/l level. All collaborators were within the allowable score limits in the ranking test. The method was adopted as official first action. (Author abstract by permission)

76-3105. Jackson, E. R. (Mississippi State Chem. Lab., Box CR, Mississippi State, MS 39762). **High-performance and gas-liquid chromography of methyl parathion formulations.** *J. Assoc. Off. Anal. Chem.* 59(4): 740-744; 1976. (13 references)

Methyl parathion formulations (a synthetic sample, a technical material, and 6 emulsifiable concentrates) were analyzed by high-performance liquid chromatography (HPLC), gas-liquid chromatography (GLC), and infrared (IR) spectroscopy. The HPLC method used an ultraviolet detector and a Permaphase ODS column with a methanol-water mobile phase. The GLC method used an SE-30/OV-210 column and flame ionization detection. The IR spectrum was recorded at 8.16 μm. A synthetic sample formulated to contain 45.5% methyl parathion (analytical grade) was analyzed 8 times by each method. HPLC yielded an average value of 45.4%, GLC 45.9%, and IR 45.7%. Analyses of variance of this repeatability study showed that the differences between the GLC mean and both the theoretical value and the HPLC mean were small, but significant. Technical methyl parathion and 6 emulsifiable concentrates were analyzed in duplicate by each method. Variance calculations for each set of duplicates by each method indicate a high probability of difference in the methods. High results from the IR analysis are probably due to impurities in the technical material because analysis of the synthetic sample was satisfactory. The HPLC and GLC methods appears to be precise and will be studied collaboratively. (Author abstract by permission)

76-3106. Law, M. W.; Bontoyan, W. R.; Locker, J. B. (TSD-Chem. Biol. Invest., Environ. Protect. Ag., Beltsville, MD 20705). Gas-liquid chromatography and infrared spectroscopy of resmethrin in nonaqueous aerosols. *J. Assoc. Off. Anal. Chem.* 59(4): 745-747; 1976. (2 references)

Two rapid and precise methods have been developed for the determination of resmethrin in nonaqueous aerosol formulations. The propellents are evaporated, the residue is dissolved in carbon disulfide, and the resulting solution is analyzed by gas-liquid chromatography or infrared spectroscopy. The accuracies of the methods were confirmed by a collaborative study. (Author abstract by permission)

76-3107. Skelly, N. E.; Russell, R. J.; Porter, D. F. (Anal. Lab., Dow Chem. Co., Midland, MI 48640). **Collaborative study of the high-pressure liquid chromatographic analysis of picloram-2,4-D formulations.** *J. Assoc. Off. Anal. Chem.* 59(4): 748-752; 1976. (3 references)

A high-pressure liquid chromatographic method for the analysis of picloram-2,4-D formulations has been studied by 11 collaborators. The method requires no sam-

ple preparation other than weighing and dilution. Salicylic acid is used as the internal standard. The compounds are separated on DuPont Zapax SAX (strong anion exchange resin) with 0.01 *M* sodium tetraborate and 0.002*M* sodium perchlorate as the mobile phase, and measured by ultraviolet spectroscopy at 280 nm. Coefficients of variation for the 6 samples studied ranged from 1.35 to 3.54% for picloram (4-amino-3,5,6- trichloropicolinic acid) and 0.83 to 2.30% for 2,4-D (2,4-dichlorophenoxyacetic acid). Comments from the collaborators were generally favorable. The method had been adopted as official first action for the determination of both picloram and 2,4-D in picloram-2,4-D formulations. (Author abstract by permission)

76-3108. McDermott, W. H. (Res. Develop. Dep., Union Carbide Corp., PO Box 8361, South Charleston, WV 25303). **Collaborative study of the [extraction of carbaryl from] dust and powder formulations.** *J. Assoc. Off. Anal. Chem.* 59(4): 753-757; 1976. (5 references)

Some 10% and lower guarantee carbaryl dusts cannot be quantitatively extracted by shaking with chloroform as specified in the official first action infrared method for carbaryl formulations, 6.293-6.295. The official method has been compared in a collaborative study with an alternative method in which a simple rotator has replaced the wrist-action shaking machine and a solution of 10% (v/v) methanol in chloroform has replaced chloroform. The results indicate the alternative method is superior to the official method when applied to difficult-to-extract formulations and equal to it for all other formulations. The mixed solvent-rotator alternative method has been adopted as official first action to replace the present method for the analysis of carbaryl formulation. (Author abstract by permission)

76-3109. Hofberg, A. H., Jr.; Heinrichs, L. C.; Gentry, G. A. (Ciba-Geigy Corp., PO Box 11422, Greensboro, NC 27409). **Collaborative study of a gas-liquid chromatographic method for the determination of simazine.** *J. Assoc. Off. Anal. Chem.* 59(4): 758-760; 1976. (7 references)

A gas-liquid chromatographic method for the determination of simazine in a wettable powder formulation containing about 80% active ingredient was collaboratively studied, using a matched pair scheme. The samples were dissolved in dimethylformamide containing dioctyl phthalate as an internal standard, chromatographed on Carbowax 20M, and detected by using a flame ionization detector. Analysis of the 2 samples, based on peak height measurements, showed the following results: 1.5% overall coefficient of variation, 1.03% coefficient of variation for random error, and 0.23% systematic error. Sample A was an 80% powder formulation; Sample B was a 5% dilution of Sample A by the addition of inert material. The coefficients of variation were 1.20% for Sample A and 1.54% for Sample B. The larger variation in Sample B most likely resulted from nonuniform mixing during the dilution of Sample A. Since all collaborators used the same reference standard, the variation found in Sample A is more indicative of the variability of the method. The method has been adopted as official first action. (Author abstract by permission)

76-3110. Postadzhyan, H.; Genchev, M.; Temchev, M. (Univ. Plovdiv, Bulgaria). **Nov metod za kachestven i kolichestven analiz na fungitsid s aktivno veshchestvo thinketilen-1,2-bis-ditikarbamate. [New method for the qualitative and quantitative analysis of fungicides with the active ingredient zinc ethylene-1,2-bis- (dithiocarbamate).** *Nauch. Tr. Plovdiv. Univ. (Ser. Khim.)* 12(3): 15-21; 1974. (8 references) (Bulgarian)

A new method was developed for the qualitative and quantitative analysis of fungicides containing the active ingredient zinc ethylene-1,2-bis (dithiocarbamate) (zineb). The active ingredient of the fungicide is dissolved in 5% sodium hydroxide solution. Insoluble ingredients are filtered out, followed by precipitation of the active substance with sulfuric acid and ammonium molybdate. In the presence of sodium pyrophosphate, addition of the reagent is continued until a red-violet color appears. The precipitate is filtered, washed in ethanol, acetone, and ether, and dried. The quantity of precipitate is proportional to the active ingredient (zineb) used in the fungicide. A spot reaction was also developed for detection of the fungicide. Traces of the compound give a blue color when treated with a sulfuric acid solution of ammonium molybdate. The limit of detection is 1:100,000. Conducting the reaction in a different sequence represents a spot test for molybdate.

76-3111. Kaai, M.; Ueda, K.; Yatomi, K. (Sch. Hyg., Tokyo Dent. Coll., Tokyo, Japan). **[The DTNB method for determining blood cholinesterase in experimental intoxication by *N*-methylcarbamates.]** *Nippon Noson Igakkai Zasshi (J. Jpn. Assoc. Rural Med.)* 25(3): 212-213; 1976. (Japanese)

Two methods for determination of blood cholinesterase, the pH depression method of Michel and the DTNB method as developed by the authors, were compared in experimental intoxication by several *N*-methylcarbamates. These bind to cholinesterase less strongly than organophosphorus pesticides, resulting in more rapid recovery from intoxication. After p.o. administration of propoxur, methomyl, carbaryl, pirimicarb, and allyxycarb at 10 mg/kg or parathion at 5 mg/kg to male Wistar rats, blood was collected from the heart 20 min after administration of carbamates or 60 min after parathion. Generally, the cholinesterase activity obtained by the DTNB method was lower than that obtained by the pH depression method in case of *N*-methylcarbamate intoxication. This was especially significant with propoxur, carbaryl, and methomyl. The two results coincided in the case of parathion intoxication. The cholinesterase activity measured by the DTNB method showed only slight recov-

ery even 4 hr after blood collection when the blood was kept at 4°C. Even after intoxication by large doses (150 mg/kg), the activity was extensively restored one hour after blood collection when the blood was kept at 25°C. The effect of the addition of eserine was not sufficient to preserve blood samples for longer times. Because of the possibility of recovery from reduced cholinesterase activity in methylcarbamate intoxication, the DTNB method would be better since a shorter incubation time is necessary for determination. After blood collection, the determination should be carried out within 4 hr and 1 hr, respectively, when the blood is kept at 4°C and 25°C.

76-3112. Takimoto, Y.; Onishi, J.; Miyamoto, J. (Res. Dep., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). [**The sensitivity and selectivity of a potassium bromide-thermionic detector (PTD) in gas-chromatography for the microanalysis of organophosphorus compounds.**] *J. Pestic. Sci.* 1(3): 193-199; 1976. (29 references)

The sensitivity and selectivity of the flame thermionic detector (FTD) as a detector for microanalysis of organophosphorus- and/or nitrogen-containing compounds were investigated. Results were compared with those obtained by a potassium bromide thermionic detector (PTD). The PTD showed approximately 10^4-fold greater sensitivity to organophosphorus compounds as compared with the FID and a 10^2-fold greater sensitivity to nitrogen containing compounds. The sensitivity is greatly dependent on the hydrogen flow rate. The minimum detectability of phosphorothioates and phosphonates under optimum conditions was on the order of 10 pg and 110 pg, resp. That of nitrogen containing compounds was one tenth that of phosphonates. Sulfur and chlorine containing compounds do not interfere unless the compounds were contaminated to a large extent. Thus PTD is a better detector for the analysis of organophosphorus pesticide residues in various substrates.

76-3113. Shiga, N.; Matano, O.; Goto, S. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). [**Microdetermination of residues of 1-naphthaleneacetic acid. Part 1. Analyses of pesticide residues by high speed liquid chromatography.**] *J. Pestic. Sci.* 1(3): 231-234; 1976. (2 references) (Japanese)

Satisfactory results were obtained in studies determining residues of 1-naphthaleneacetic acid in several fruits using high speed liquid chromatography. After residue extraction from fruits with phosphoric acid-acidic acetone, evaporation of the solvent from the extract, dilution with water and washing with *n*-hexane, naphthaleneacetic acid was extracted with ether from the aqueous solution at pH 2. After drying the solution and evaporating the ether, the residue was dissolved in methanol, and the solution was injected onto a high speed liquid chromatograph with a glass column packed with Hitachi-gel No. 3010. The eluate from the column with methanol plus water (19:1) was mixed with alkaline methanol just before injection onto a gas chromatograph. The detector was a fluorophotometer with excitation wavelength at 230 or 290 mm and emission wavelength at 330 mn. In the case of residues in melon, pineapple, and apple, no interference or quenching of fluorescence was observed. The limit of detection in the case of 50 g samples of fruit was 0.004 ppm, with recovery of about 90%.

76-3114. Sharp, R. B. (Nat. Inst. Agric. Eng., Wrest Park, Silsoe, Bedford, England). **Measurement of herbicide spray deposits on foliage by fluorescence. I. Paraquat deposits on *Vicia faba*.** *Pestic. Sci.* 7(3): 315-319; 1976. (3 references)

An investigation revealed a paraquat-compatible fluorochrome that fluoresces at 600 nm where the herbicide fluorescence is negligible. Acceptable amounts of this fluorochrome are recoverable from dry spray deposits of paraquat + fluorochrome mixture sprayed on various broad-leaf weeds and bean leaves, but care must be taken if a wetting agent is used for extraction purposes because the fluorescent intensity of the fluorochrome is affected by wetting agents. A procedure is given for extracting and measuring the fluorochrome from spray deposits on foliage. (Author abstract by permission)

76-3115. Akabori, F.; Masaoka, T. (Azabu Univ., Tokyo, Japan). [**Basic studies on examination of the toxicity of pesticides. XII. Analysis of organochlorine pesticide residues in organs by mass fragmentography.**] *Proc. Annu. Meet. Jpn. Soc. Vet. Sci.* 81: 60; 1976. (Japanese)

Organochlorine pesticide residues were determined in organs taken from dogs using a gas chromatograph-mass spectrometer provided with a high speed Peak-Matcher multiple detector. The minimum detectable amounts of α-, β-, γ-, and δ-BHC, o,*p*′-DDT, *p*,*p*′-DDT, *p*,*p*′-DDE, *p*,*p*′-DDD (TDE), aldrin, dieldrin, endrin, and heptachlor were 1,2,2,2,2,3,0.5,2,1,2, 10 and 20 mg according to mass fragmentography. The residue of lindane in the body of dogs to which it had been administered orally was about the same as that found by gas chromatography with ECD. The application of mass fragmentography in the determination of pesticide residues should provide an effective tool.

76-3116. Wozniak, J.; Tokarz, A. (Inst. Biofarm., Akad. Med., Warsaw, Poland). **Oznaczanie dwufenylu w owocach cytrusowych za pomoca chromatografii gazowej.** [**Determination of biphenyl in lemons, oranges, and grapefruits by means of gas chromatography.**] *Rocz. Panstw. Zakl. Hig.* 27(2): 177-184; 1976. (15 references) (Polish)

Gas chromatographic methods for determining biphenyl residues in oranges, lemons, and grapefruits are described. A Pye-Unicam series 104 gas chromatograph was used for the studies with a glass column packed with Gas-Chrom Q and 3% OV-17 as the stationary phase. Biphenyl was extracted with cyclohexane from

homogenized peels and fruits. A statistical analysis was performed on the results achieved thus far.

76-3117. Fukuhara, K.; Takeda, M.; Uchiyama, M. (Food Drug Safety Cent., Hatano, Kanagawa, Japan). [**Studies on the determination of pesticide residues in foods. Part 20. Analytical method for chlorobenzilate, chloropropylate, phenisobromolate, and tetradifon in crops.**] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 17(4): 302-307; 1976. (7 references) (Japanese)

A method was developed for simultaneously determining chlorobenzilate, chloropropylate, phenisobromolate (bromopropylate), and tetradifon in crops in the presence of organochlorine pesticides such as BHC, polychlorocyclodienes, and DDT including its derivatives by gas chromatography with ECD. The method consists of extracting the sample (100 g) with acetone (100 ml) and *n*-hexane (100 ml x2), cleaning up on an active carbon-florisil column, and eluting with 100 ml of a mixture of *n*-hexane and benzene (2:3 by volume) and 100 ml of a mixture of *n*-hexane and ether to separate organochlorine pesticides and benzilates. Gas chromatography is performed on a column packed with 2% DEGS plus 0.5% phosphoric acid, 5% OV-17, or 5% XE-60. This method was applied on seven kinds of fortified crops such as Satsuma orange, plum, watermelon, tomato, cucumber fruit, lettuce, and tea leaves. Percentage recoveries of chlorobenzilate were 94.2, 80,0, 85.3, 87.1, 84.7, 81.7 and 82.7, those of chloropropylate were 86.0, 83.1, 84.7, 80.4, 82.0, 81.7 and 83.3, those of phenisobromolate were 88.3, 88.2, 86.3, 96.0, 87.4, 85.7 and 89.0, and those of tetradifon were 86.0, 87.5, 91.0, 94,0, 97.3, 89.3 and 91.7, respectively. This method is also applicable for determining organochlorine pesticide residues, as indicated by high recoveries from fortified crops, ranging from 87.0 to 96.7%.

76-3118. Honikel, K. O.; Hambloch, H. (Inst. Chem. Phys. Bundesanst. Fleischforsch., D-8650 Kulmbach, Germany). **Schnelle fluorimetrische Bestimmung von Chlortetracyclin in Fleisch und Knochen.** [**Rapid fluorimetric assay of chlortetracycline in meat and bone.**] *Z. Lebensm. Unters. Forsch.* 161(4): 337-346; 1976. (14 references) (German)

A fluorimetric assay of chlortetracycline in meat and bone was developed. The method enables specific determinations of tetracyclines and reduces the time for assay to 4 hr. The method is based on the determination of tetracyclines as published by Kohn in 1961, which was modified for the determination of chlortetracycline in meat and bone. Tetracycline are fluorescent compounds whose quantum yields are much enhanced in most cases by forming a complex with $Ca^{2}+$ ions and then extraction into an organic solvent. On transfer into ethyl acetate the chlortetracycline is separated from interfering substances. Yields of chlortetracycline were about 80%; sensitivity of detection, 0.5 ppm.

76-3119. Stadnizhenko, E. I.; Volkova, E. A. (Kharkov Pharm. Inst., Kharkov, USSR). **O vydelenii trikhlormetafosa iz biologicheskogo materiala distilliatsiei s vodnymi parami.** [**Isolating trichlormetaphos from biological matter by steam distillation.**] *Sud.-Med. Ekspert.* 19(1): 27-31; 1976. (Russian)

A steam distillation method was developed for the extraction of trichlorometaphos (ronnel) from biological materials and different methods are reviewed for the qualitative and quantitative determination of its residues. Steam distillation is done in the presence of sodium chloride, tartaric acid, and distilled water. Trichlorometaphos is extracted from the distillate with chloroform, and acetone is used for extraction of the dry residue obtained on evaporation. An enzymatic colorimetric reaction with cholinesterase and a standard indicator may be used at a detection sensitivity of 1 μg/2 drops. Qualitative chromatographic determination on chromatographic paper is done with 4-aminoantipyrine and ferricyanide after treatment with sodium hydroxide, or with silver nitrate and bromophenol blue in acetone. The sensitivity is 5 μg/spot for the first method and 20 μg/spot for the second. Quantitative determination is done by means of 4-aminoantipyrine, assuming direct correlation between the trichlorometaphos concentration and the size of the colored spot, or by means of phosphorus-molybdenum heteropolycomplex.

76-3120. Bruns, V. F.; Carlile, B. L.; Kelley, A. D. (Irrigated Agric. Res. Extension Ctr., Western Region, Agric. Res. Serv., Prosser, WA). **Responses and residues in sugarbeets, soybeans, and corn irrigated with 2,4-D or silvex-treated water.** *U.S. Dep. Agric. Tech. Bull.* No. 1476, 1973, 31p. (28 references)

Analytical methods for determining 2,4-D and silvex residues in water, soil, and plant material were studied, tested, and modified or developed as necessary. The basic method used converted the alkanolamine salts of 2,4-D and the propylene glycol butyl ether (PGBE) ester of silvex to the methyl ester by esterification with boron trifluoride in methanol, and the derivatives were measured on a gas chromatograph equipped with an electron capture detector. 2,4-D and silvex could be reliably measured in water at the 0.0004 and 0.0001 ppm levels, respectively; in soil at the 0.0002 and 0.0005 ppm levels, respectively; and in plant material at the 0.005 ppm level. In field experiments, the alkanolamine salts of 2,4-D and the PGBE ester of silvex were applied by furrow or sprinkler irrigation to sugarbeets, soybeans, and dwarf corn at 0-5.51 ppmw. On the furrow-irrigated plots, 5.51 ppmw of either pesticide injured the crops, but the quantitative yield was reduced only in the case of the soybeans and only by silvex. At 0.22 ppmw, neither injury nor reduced yield was observed. On the sprinkler-irrigated plots, silvex, but not 2,4,-D, injured the surgarbeets and soybeans and decreased the soybean yield at 0.22 and 2.21 ppmw. The residue concentrations in the crops were many times below the tolerances in effect in 1972 for certain foods and forages for human and livestock

consumption, although irrigation of certain crops with silvex-treated water from ponds or lakes before adequate degradation has occurred or adequate tolerances have been established should be avoided.

See also **76-2884** **76-2997**

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

Pesticides Abstracts is available on 16 mm microfilm. Additional information can be obtained from the Technical Services Division.

ORDER FORM FOR
PESTICIDES ABSTRACTS

To: Superintendent of Documents
Government Printing Office
Washington, D.C. 20402

Please enter my subscription for Pesticides Abstracts. I am enclosing Money Order ☐ Check ☐ for this subscription.
(**$18.25 a year; $4.60 additional for foreign mailing.**)

Please address as follows: _____

_____

_____

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 1968

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Subscription price, domestic, $18.25 a year, $4.60 additional for foreign mailing. Price for a single copy of this issue is $1.40, Index issue $2.35.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
RM. EB-49, 401 M STREET, S. W.
WASHINGTON, D. C. 20460

POSTAGE AND FEES PAID
FOURTH CLASS RATE BOOK
EPA-338

U.S.MAIL

Serials Department
Xerox University Microfilms
300 North Zeeb Road
Ann Arbor, MI 48106 EPA 18-1

If you do not desire to continue receiving this publication, please CHECK Here□; cut off this label and return it to the above address. Your name will then be removed from the mailing list.

MISC.